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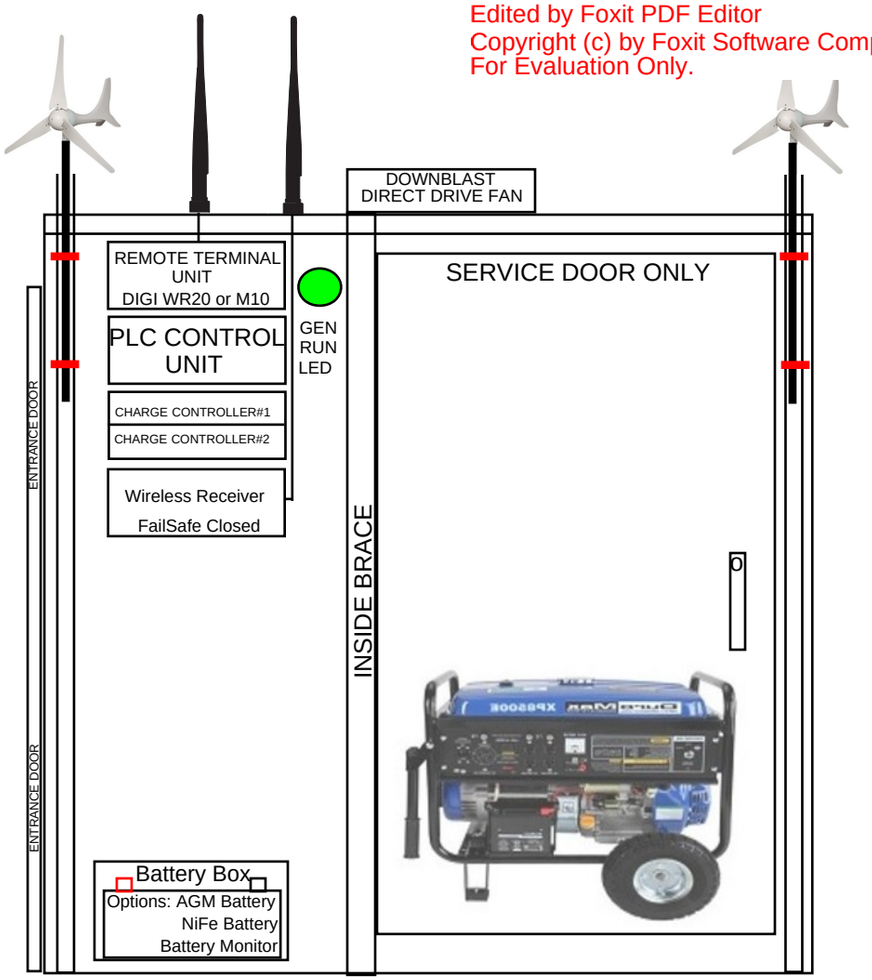
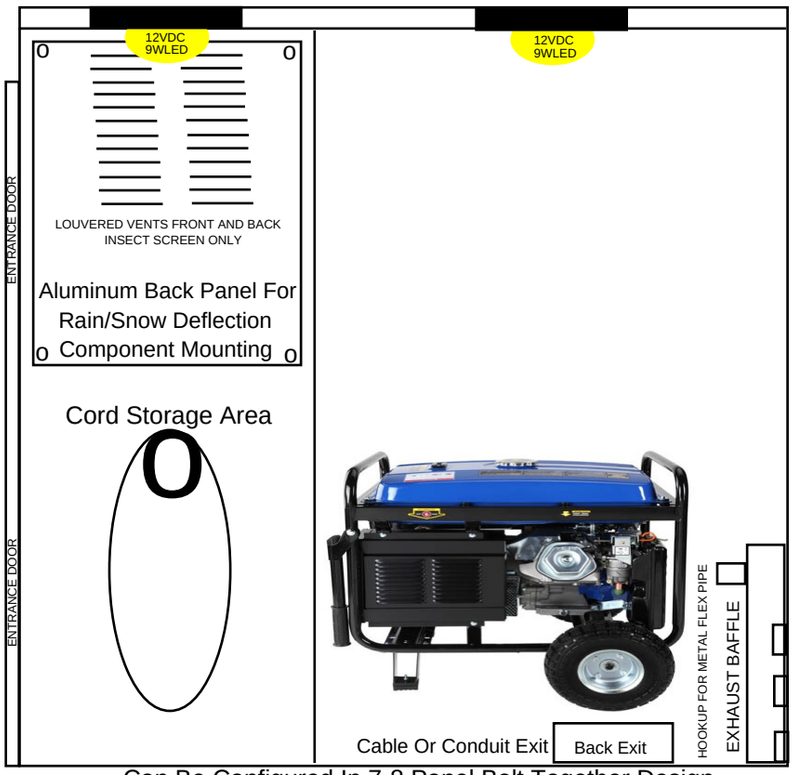
ENTRANCE DOOR OPENING WIDTH 25"
OPTIONS SHOWN
70"L x 35"W x 70"H



PLC CONTROL UNIT TO CONTROL REMOTE STARTING OF GENERATOR DURING WEEKLY ROUTINE RUN AND EMERGENCY
FOR BACKUP,PLC CONTROL UNIT CAN BE USED TO CONTROL TRAFFIC USING BASIC TIME CONFIGURATION
Must Plug In Power Monitor To Generator To Allow Plc Unit To Confirm Run Condition.



Can Be Configured In 7-8 Panel Bolt Together Design

DDAR
AXIAL DOWNBLAST DIRECT DRIVE FANS

- Air Volume: 2 - 2400 cfm
- Maximum SP: 1.5" wg. @ standard air density

Axial Direct Drive Fans are the perfect low cost exhaust choice in the areas that have little or no ductwork, and thus, relatively low to moderate resistance.

FEATURES & BENEFITS

- Spun aluminum housing for rust-free weather resistant durability
- Propellers constructed with die formed blades riveted to a steel hub
- Can be roof or wall mounted
- Standard bird screen
- Wire conduit to provide a clear channel for electrical connections
- Emergency Disconnect Switch

OPTIONS

- Gravity Damper.
- Motorized Damper.
- Wall Mount Sleave.
- Roof Curb.

CERTIFICATIONS

FloAire certifies that Model DDAR10 thru DDAR18 shown herein are licensed to bear the AMCA seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 211 and comply with the requirements of the AMCA Certified Rating Program.

Models DDAR10 thru DDAR18 are ETL Listed under file number 3049729-002 and comply with UL705 (electrical) Standards and CSA Std C22.2, No 113.

Catalog #109F
March 2009

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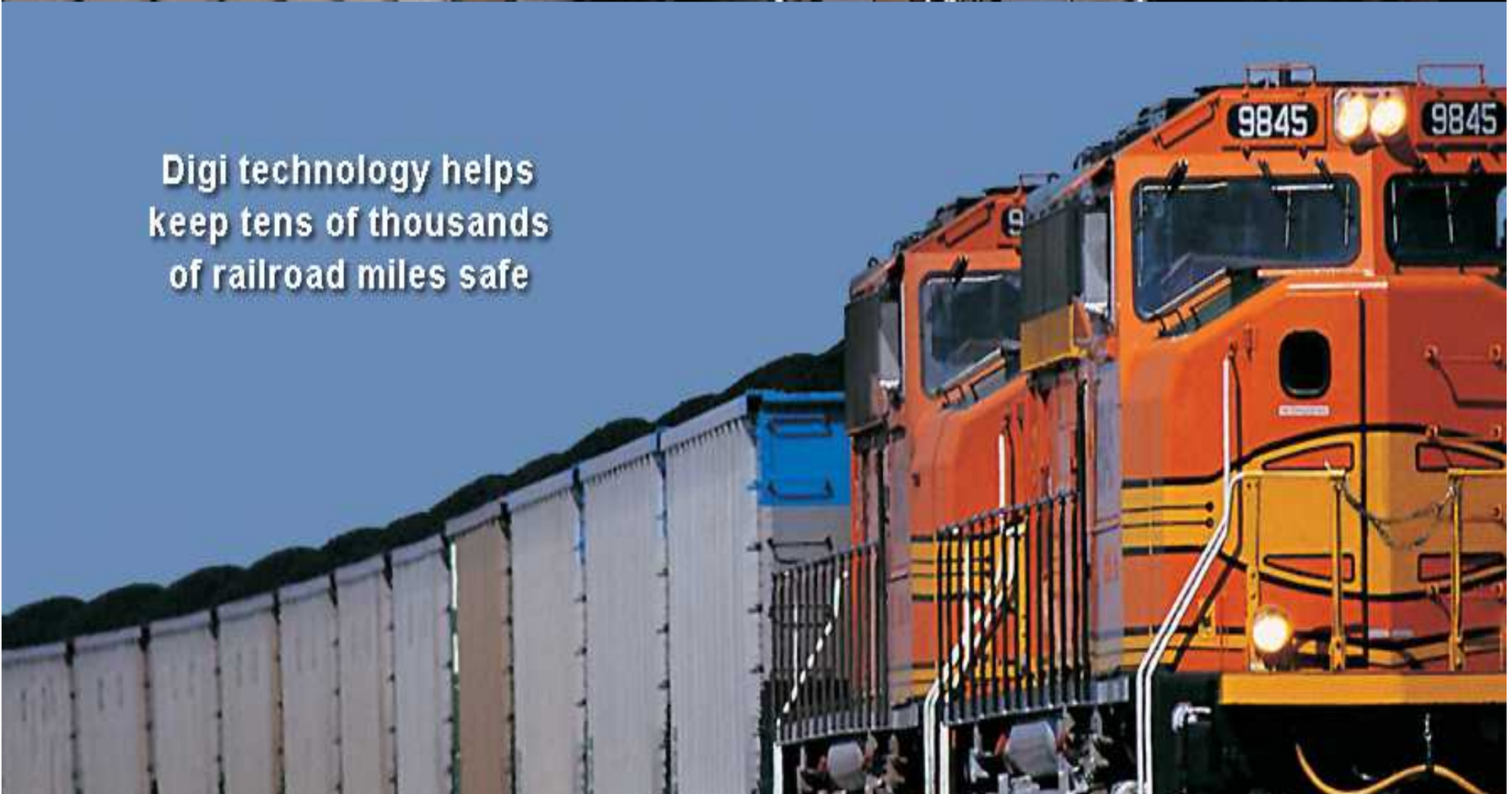


Digi TransPort® WR21

Compact Enterprise Class Cellular Router

Compact, flexible, low-cost enterprise 2.5G/3G/4G cellular router for remote and mobile networking applications.

Overview

Digi TransPort WR21 is a full-featured cellular router offering the flexibility to scale from basic connectivity applications to enterprise class routing and security solutions. With its high-performance architecture, Digi TransPort WR21 provides primary and backup connectivity and is designed for Wide Area Network connectivity including 2.5G/3G/4G networks and beyond. Optional Gobi™ module provides true HSPA+/EV-DO carrier diversity in a single solution.

Flexible power and connectivity options, along with extended temperature ranges make Digi TransPort WR21 a versatile product for both commercial and industrial environments.

Digi TransPort WR21 is available in both standard routing and enterprise configurations. The standard version offers basic routing, NAT and security, while the enterprise version adds advanced routing, security/VPN and stateful firewall. Advanced features allow the Digi TransPort WR21 to be used as a component of a PCI compliant network.

Digi management solutions provide easy setup, configuration and maintenance of large installations of remote Digi TransPort devices. iDigi® Manager Pro™ offers web-based device management for remote Digi cellular routers and gateways. Also available is the windows based Digi Remote Manager™ for customer installed device management and reporting.

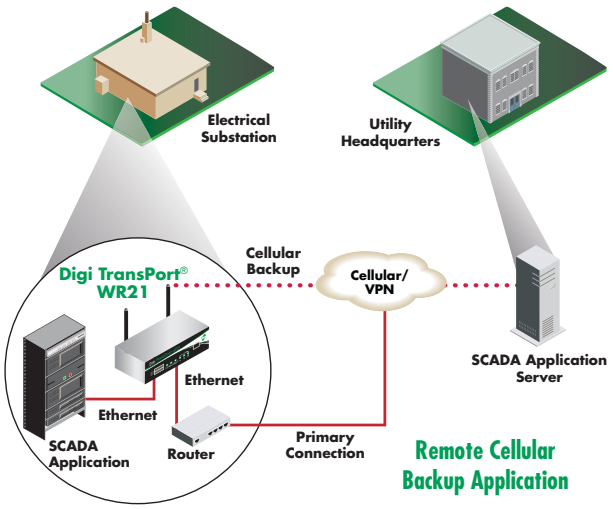
Related Products

VPN Concentrators

Digi Remote Management

Accessories

Application Highlight



Remote Cellular Backup Application

Features/Benefits

- Compact, low-cost, flexible cellular routing platform with standard and enterprise feature sets
- Standard option includes basic routing and IP filtering; Enterprise option includes advanced routing protocols, VPN and stateful firewall
- High-performance architecture, flexible power and extended operating temperature
- 2.5G/3G/4G cellular interface including: including LTE, GSM:EDGE, HSPA, HSPA+ and CDMA: 1xRTT, EV-DO
- RS-232 serial and 10/100 Ethernet or RS-232/422/485 serial and 2-port Ethernet switch
- Digi remote management software solutions (including the iDigi® Device Cloud™ service) provide easy setup, configuration and maintenance of large installations

Specifications	Digi TransPort® WR21
Wireless Interfaces	
WWAN**	
GSM/CDMA Gobi (U8)	GSM and CDMA supported on the same module via Gobi diversity; UMTS/HSPA/HSPA+ (850/900/1700 AWS/1800/1900/2100 MHz with Rx Diversity); EV-DO Rev A (800/1900 MHz with Rx Diversity); Transfer rate (max): 5.76 Mbps Up, 14.4 Mbps Down
LTE - Verizon (coming soon) (L2)	700 MHz, Verizon LTE; Fall back to CDMA 850/1900 MHz; Transfer rate (max): 50 Mbps up, 100 Mbps down
LTE - AT&T (coming soon) (L3)	700 MHz / AWS, GSM LTE; 3G fall back to HSPA 850/AWS/1900/2100 MHz; 2G fallback to 850/900/1800/1900 MHz; Transfer rate (max): 50 Mbps up, 100 Mbps down
Edge (E1)	GPRS/EDGE Class 10; 850/900/1800/1900 MHz; Transfer rate (max): 236 Kbps up/down
CDMA 450 (Cx)	450 MHz; R-UIM support; Transfer rate (max): 1.8 Mbps up, 3.1 Mbps down
CDMA 1xRTT (Bx)	800/1900 MHz; Transfer rate (max): 153Kbps up/down
Connectors	U8, L2, & L3 variants: 2 x 50 Ω SMA (Center pin: female); E1, Cx, Bx variants: 1 x 50 Ω SMA (Center pin: female)
SIM Slots	2
SIM Security	Optional SIM slot cover plate
Other	
Additional Features	Send GPS via UDP/IP, TCP/IP (up to two destinations) or serial; Customize and/or send data using Python; GPS status query; Time source capable
Wired Interfaces	
Serial	
Ports	1
Standard	Option of RS-232 or RS-232/422/485
Async/Sync	Async
DTE/DCE	DCE
Signal Support	TXD, RXD, RTS, CTS, DTR, DCD, DSR, RI
Flow Control	Software (XON/XOFF), Hardware supported
COM Port Redirector	RealPort®
Connector	DB-9
Ethernet	
Ports	Option of 1 or 2
Standard	IEEE 802.3
Physical Layer	10/100 Base-T
Data Rate	10/100 Mbit/s
Mode	Full or Half duplex
Interface	Auto MDI/MDIX
Connector	RJ-45
USB	
Ports	Option of 1 or 2
Standard	USB 2.0
Signaling	High-speed
Connector	Type A
Other	
I/O	N/A
DSL	N/A
Software/Management	
Remote Management	iDigi® Manager Pro™ (cloud based); Digi Remote Manager™ (user installed/managed); SNMP v1/v2c/v3 (user installed/managed)
Local Management	Web interface (HTTP/HTTPS); CLI (Telnet, SSH, SMS, Serial Port)
Management/ Troubleshooting Tools	FTP, SFTP, SCP; Protocol analyzer with PCAP for Wireshark; Event logging with Syslog and SMTP; NTP/SNTP
Software Packages	Option of Standard or Enterprise. See next page for details.
Memory	128 MB NAND Flash/128 MB DDR2 SDRAM

* Optional hardware
** Transfer rates are theoretical and network operator dependent
*** Reduced cellular performance may occur above +60° C. Standard temperature power supplies may reduce temperature range.

Specifications	Digi TransPort® WR21
Power	
Input	9-30 VDC
Consumption	6W max, 4W typical
Connector	Depending on model: Locking barrel or screw-down removeable terminal block
DC Power Cord*	Locking barrel to bare wire
DC Power Supply*	100-240 VAC 50/60 Hz; Option of standard temperature or extended temperature
Battery Backup	None
Physical	
Dimensions (L x W x H)	3.9 in x 5.2 in x 1.3 in (100 mm x 131 mm x 32 mm)
Weight	1.08 lb (0.49 kg)
Status LEDs	Power, Service, WWAN, 3x Signal strength
Enclosure Material/Rating	Industrial (Metal)/ IP50
Mounting	Brackets for wall mount & DIN rail sold separately
Environmental	
Operating Temperature ***	-35° C to +75° C
Storage Temperature	-40° C to +85° C
Relative Humidity	20% to 95% (non-condensing)
Ethernet Isolation	1.5 kV RMS
Serial Port Protection (ESD)	15 kV
Hazardous (Class 1 Div 2)	Optional
Conformal Coating	N/A
Approvals	
GSM/UMTS	PTCRB, NAPRD.03, GCF-CC, R&TTE, EN 301 511
CDMA/EV-DO	CDG TIA/EIA-690, CDG TIA/EIA-98-E
Cellular Carriers	Certified by most major carriers.
Safety	UL 60950, CSA 22.2 No. 60950, EN60950
Emissions/Immunity	CE, FCC Part 15 Class B, AS/NZS CISPR 22, EN55024, EN55022 Class B
Industry	N/A
Warranty	
Product Warranty	5 years

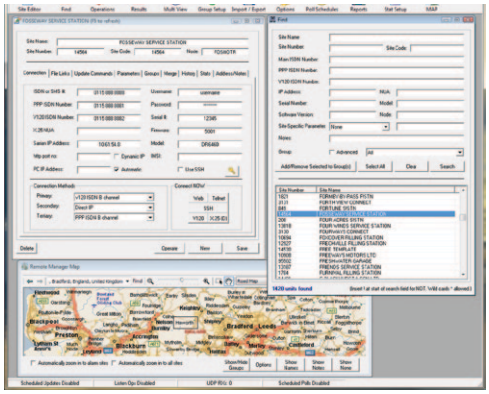
Software Packages	Enterprise	Standard
Protocols	Same as Standard plus iDigi; Dynamic DNS client compatible with BIND9/No-IP/DynDNS	HTTP, HTTPS, FTP, SFTP, SSL, SMTP, iDigi SNMP, SNMP (v1/v2c/v3), SSH, Telnet and CLI for web management; remote management via software tool (option); SMS management, protocol analyzer, ability to capture PCAP for use with Wireshark; DynDNS
Security/VPN	Stateful inspection firewall with scripting, address and port translation; VPN: IPSec with IKEv1, IKEv2, NAT Traversal; SSL, SSLv2, SSLv3, FIPS 197, Open VPN client and server; PPTP, L2TP; VPN Tunnels: 5 included. Additional available: WR21 (5 max.), WR41 (50 max.), WR44/WR44R/WR44RR (200 max.; Cryptology: SHA-1, MD5, RSA; Encryption: DES, 3DES and AES up to 256-bit; Authentication: RADIUS, TACACS+, SCEP for X.509 certificates; Content Filtering (via 3rd party); MAC Address Filtering; VLAN support; Ethernet Port	IP filtering
Routing/Failover	IP pass-through; NAT, NAPT with IP Port Forwarding; Ethernet Bridging; GRE; Multicast Routing;Routing Protocols: PPP, PPPoE, RIP (v1, v2) OSPF, SRI, BGP, iGMP routing (multicast); IPv6 (firmware upgradable); RSTP (Rapid Spanning Tree Protocol); IP Failover: VRRP, VRRP+TM; Automatic failover/ failback to second GSM network/Standby APN	IP pass-through NAT, NAPT with IP Port Forwarding
Other Protocols	DHCP; Dynamic DNS client compatible with BIND9/No-IP/DynDNS; QoS via TOS/DSCP/WRED	DHCP; Dynamic DNS client compatible with BIND9/No-IP/DynDNS
Specialty/Legacy Protocols	RealPort®; Modbus UDP/TCP to serial; X.25 including XOT, SNA/IP, TPAD and PAD; Protocol switch*	RealPort®

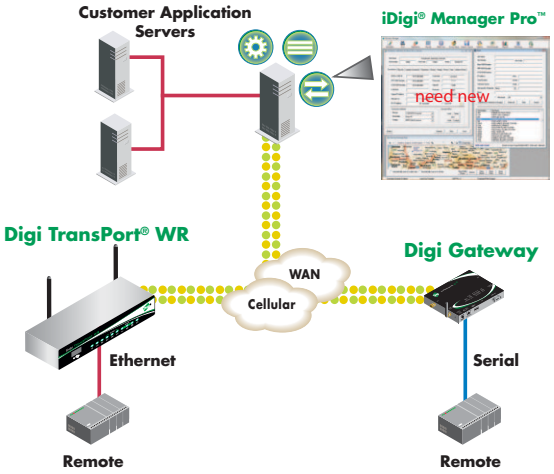
* Optional hardware
** Transfer rates are theoretical and network operator dependent
*** Reduced cellular performance may occur above +60° C. Standard temperature power supplies may reduce temperature range.

Device Management Features

- View of all remote devices and their connection status
- Automatic registration of newly connected devices
- Remote device configuration
- Actions include device grouping and scheduling of operations
- Monitoring of user specified events
- Device statistic and report generation
- Alarm generation and alerting
- Secure access to all devices from web browser, anywhere
- Remote reboot of device and default reset
- Remote device management with iDigi Manager Pro, a Digi-hosted device management software

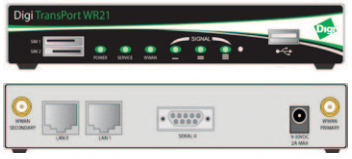
Easy Remote Configuration and Management





Line Art

Digi TransPort WR21



Visit www.digi.com for part numbers.

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Digi technology helps
keep tens of thousands
of railroad miles safe

Digi m10™

Compact Satellite Modem

Small footprint satellite modem with global satellite connectivity is designed for a wide variety of asset tracking and remote device communication applications.

Overview

The Digi m10 satellite module provides worldwide satellite data connectivity for a wide variety of asset-tracking and industrial remote communication applications.

Operating on the ORBCOMM low-earth orbit (LEO) satellite network, it is designed to enable cost-efficient Machine-to-Machine (M2M) communication with virtually unlimited global coverage and no blockage. All at a typical low monthly cost comparable to cellular plans for low data volume M2M applications.

Built on Digi's own patented mixed signal chip designed and tailored for satellite applications, the Digi m10 modem offers immediate product design integration through its integrated serial interface. With full support for industrial temperature and operational shock/vibration specifications exceeding SAE J1455, it is the ideal choice for reliable and highly cost-efficient satellite connectivity in even the most demanding application.

The Digi m10 kits provide all necessary components for quick and easy product evaluation, development and prototyping.

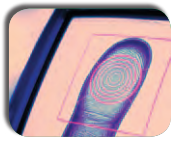
Target Applications

Utilities

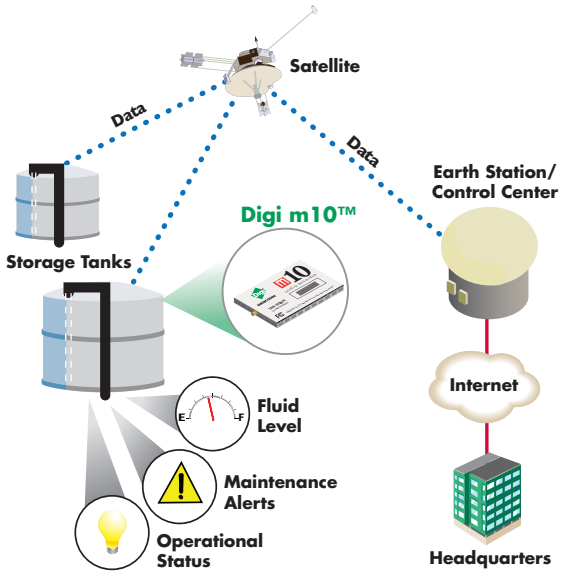
Industrial Automation

Remote Device Management

Transportation


Security

Application Highlight



Features/Benefits

- Cost-efficient with leading performance
- Global LEO satellite coverage (no blockage)
- Extremely compact module form factor
- Highly integrated using Digi satellite technology
- Very low transmit and receive power
- Industrial operating temperature
- Highly shock and vibration resistant
- Quick and simple product design integration
- Direct PCB mount or cable connection

Do-more H2 Series PLC Overview

Do-more H2 Series PLC Modules

The Do-more H2 Series PLC is the newest technology available that makes control applications easier to implement. It uses proven DirectLOGIC hardware as a platform for a powerful, flexible instruction set, with a user-friendly programming environment. The Do-more H2 Series PLC utilizes most of the modules that are part of the DL205 PLC family. You simply install a Do-more H2 Series CPU module into a DL205 base unit. However, the specifications of the Do-more H2 Series PLC are very different from the DL205 PLC. This overview covers the key features of the Do-more H2 Series PLC.

Do-more H2 CPU Module

DL205 PLC base unit and I/O modules

CPU modules

The Do-more H2 Series PLC offers two CPU modules available, H2-DM1 and H2-DM1E, both of which must be programmed using the Do-more Designer programming software. You cannot use the existing DL205 CPU modules (D2-230, D2-240, D2-250(-1) and D2-260) with Do-more Designer.

H2-DM1

H2-DM1E (with Ethernet)

Base units

The Do-more H2 Series PLC supports all of the base units available for the DL205 PLC.

Do-more H2 Series PLC Overview

Discrete I/O modules

The Do-more H2 Series PLC supports all of the discrete I/O modules available for the DL205 PLC.

Analog I/O modules

The Do-more H2 Series PLC supports all of the analog I/O modules available for the DL205 PLC.

Do-more H2 Series PLC Overview

Specialty modules

The Do-more H2 Series PLC supports many of the specialty modules available for the DL205 PLC. The following modules are supported:

H2-ECOM100

H2-SERIO

H2-SERIO-4

H2-ERM

H2-CTRIO

H2-CTRIO2

F2-08SIM

Specialty modules NOT supported

The following modules are NOT supported by the Do-more H2 Series PLC.

D2-DCM

D2-RMSM

D2-CTRINT

F2-CP128

D2-EM

D2-CM

D2-RSSS

DV-1000

D2-HPP

Programming Software

The Do-more H2 Series PLC can only be programmed by Do-more Designer. (DirectSOFT programming software is not compatible with Do-more PLCs)

Do-more H2 Series PLC Overview

Module Compatibility

The following table shows which DL205 components are supported by the H2-DM1 and H2-DM1E Do-more CPUs.

Module Compatibility Table					
Module	**Part Number**	**Status**	**Module**	**Part Number**	**Status**
Base Units	D2-03B-1	✓	***Analog I/O Modules***	F2-04AD-1	✓
	D2-04B-1	✓		F2-04AD-2	✓
	D2-06B-1	✓		F2-08AD-1	✓
	D2-09B-1	✓		F2-08AD-2	✓
	D2-03BDC1-1	✓		F2-04RTD	✓
	D2-04BDC1-1	✓		F2-04THM	✓
	D2-06BDC1-1	✓		F2-02DA-1(L)	✓
	D2-09BDC1-1	✓		F2-02DA-2(L)	✓
	D2-06BDC2-1	✓		F2-02DAS-1	✓
	D2-09BDC2-1	✓		F2-02DAS-2	✓
Discrete I/O Modules	D2-08ND3	✓		F2-08DA-1	✓
	D2-16ND3-2	✓		F2-08DA-2	✓
	D2-32ND3	✓		F2-4AD2DA	✓
	D2-32ND3-2	✓		F2-8AD4DA-1	✓
	D2-08NA-1	✓		F2-8AD4DA-2	✓
	D2-08NA-2	✓	***Local Expansion Modules***	D2-CM	No
	D2-16NA	✓		D2-EM	No
	D2-04TD1	✓	***Specialty Modules***	H2-ERM	✓
	D2-08TD1	✓		H2-ERM-F	✓
	D2-08TD2	✓		D2-RMSM	No
	D2-16TD1-2	✓		D2-RSSS	No
	D2-16TD2-2	✓		H2-ECOM100	✓
	F2-16TD1P	✓		H2-ECOM-F	✓
	F2-16TD2P	✓		D2-DCM	No
	D2-32TD1	✓		H2-EBC100	✓
	D2-32TD2	✓		H2-EBC-F	✓
	D2-08TA	✓		H2-SERIO	✓
	F2-08TA	✓		H2-SERIO-4	✓
	D2-12TA	✓		F2-CP128	No
	D2-04TRS	✓		H2-CTRIO	✓
	D2-08TR	✓		H2-CTRIO2	✓
	F2-08TR	✓		D2-CTRINT	No
	F2-08TRS	✓		F2-08SIM	✓
	D2-12TR	✓	***Programmer***	D2-HPP	No
	D2-08CDR	✓	***Operator Interface***	DV-1000	No

✓ = Supported No = Not Supported

Do-more H2 Series PLC Overview

Communications

The Do-more H2 Series PLC supports many communication protocols. The following table shows which CPU module communications port or specialty module supports each protocol.

Protocols	CPU Modules			Specialty Modules			
	H2-DM1 / H2-DM1E		H2-DM1E	H2-ECOM100	H2-ECOM H2-ECOM-F	H2-SERIO H2-SERIO-4	H2-ERM H2-ERM-F
	USB Port	RS-232 Serial Port	Ethernet Port				
Do-more Designer Programming	Yes	Yes	Yes	Yes		Yes	
Modbus/RTU Client (Master)		Yes				Yes	
Modbus/RTU Server (Slave)		Yes				Yes	
Modbus/TCP Client (Master)			Yes	Yes			
Modbus/TCP Server (Slave)			Yes	Yes			
DirectLOGIC RX/WX Client (Master)			Yes	Yes	Yes		
DirectLOGIC RX/WX Server (Slave)			Yes	Yes	Yes		
K-Sequence Server (Slave)		Yes		Yes	Yes	Yes	
DirectNET Server (Slave)				Yes	Yes		
HEI Ethernet Remote I/O Master							Yes
SMTP (EMail) Client w/Authentication			Yes				
Simple Network Time Protocol (SNTP) Client			Yes				
Do-more/PEERLINK			Yes				
Do-more Time Synchronization Protocol (Client, Server, Alternate Client)			Yes				
Do-more Logger/UDP			Yes				
Serial ad-hoc ASCII/Binary Programatic Control		Yes				Yes	
UDP ad-hoc Programmatic Control			Yes				
TCP Client Programmatic Control			Yes				
TCP Server Programmatic Control			Yes				

Blank = Not Supported

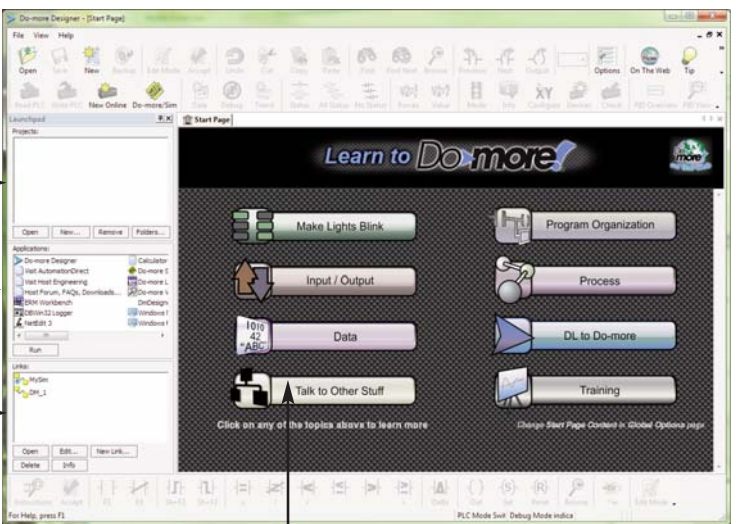
Do-more H2 Series PLC Overview

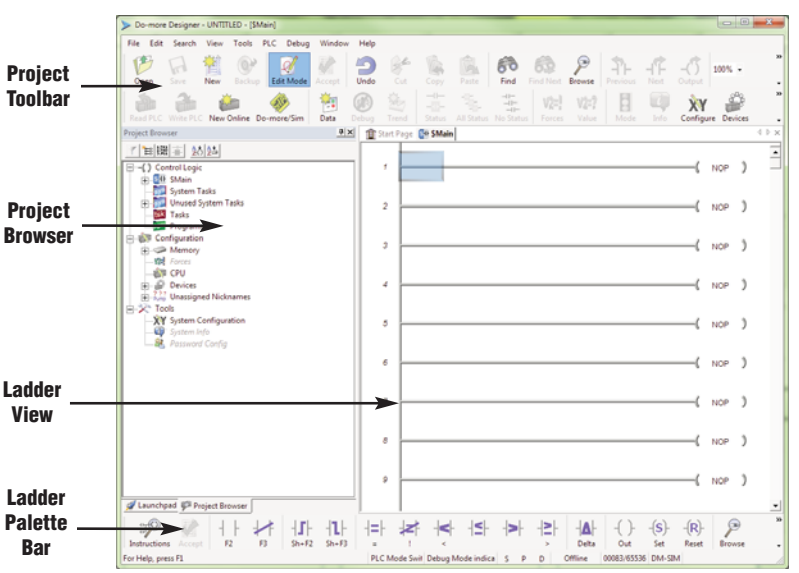
Do-more Designer (Part No. DM-PGMSW)

Do-more Designer is the full-featured programming software for the Do-more PLC series. Do-more Designer is a free download from Automationdirect.com. A CD-ROM version is also available for purchase.

Start Page

When the software is started, the Start Page is displayed. This page contains a Launchpad with Projects, Applications and Links windows. It also contains shortcuts to important help file topics and the Do-more Simulator.





Main Programming Window

The Main Programming Window is displayed when a new program is started or an existing program is opened. It is divided into Menus, Toolbars, and Windows that work together to make project development as simple as possible.

Do-more H2 Series PLC Overview

Do-more Designer Features

Do-more Designer has the following main features:

- Supports the Do-more PLC instruction set
- Project Browser (Window to organize the user project)
- Data View (Interface to monitor PLC data in a list)
- Trend View (Interface to monitor PLC data with trend graphs)
- PID View (Interface to monitor and tune the individual PID control loop)
- PID Overview (Interface to monitor multiple PID control loops)
- Debug View (Interface to debug the ladder programs)

When Do-more Designer is installed on your PC, the following tools are also installed:

- Do-more Simulator (Offline simulator of ladder program execution and PID control)
- Do-more Logger (Software tool to log PLC data)
- ERM Workbench (Configuration tool for the ERM modules)
- NetEdit 3 (Configuration tool for the ECOM/EBC Ethernet modules)

PC Requirements

The Do-more Designer Windows-based programming software works with Windows® XP (Home or Professional, 32-bit), Vista (Home, Basic, Premium, 32 or 64-bit) or Windows 7 (Home, Professional, Ultimate, 32 or 64-bit). Please check the following requirements when choosing your PC configuration:

- Minimum PC to PLC Connectivity, at least one of the following:
  - USB Port: connects to the CPU with USB-A connector (USB-A to USB-B cable)
  - RS-232 Serial Port: connects to the CPU with RJ-12 connector (RJ-12 to DB9 or RJ-12 to USB-B serial converter cable)
  - Ethernet Port: connects to the CPU (H2-DM1E) with RJ-45 10Base-T or 100Base-T (Cat5 Patch Cable)
- Hard Disk: 100MB free disk space
- Video Display: 1024x768, 256 colors resolution (1280x720, true color recommended)
- Windows XP, 32-bit:
  - 800MHz, single core CPU (2GHz, multi-core or hyperthreaded recommended)
  - 512MB RAM (2GB recommended)
- Vista or Windows 7, 32 or 64-bit:
  - 1GHz, single core CPU (2GHz, multi-core recommended)
  - 1GB RAM (3GB recommended)

Programming Cables

The Do-more H2 Series CPU module H2-DM1 has two communication ports (USB and RS-232 serial) and the H2-DM1E has three communication ports (USB, RS-232 serial and Ethernet). You can use any of those ports for programming and monitoring. Needed cables for these ports are listed below and can be purchased at Automationdirect.com.

USB Cables (USB 2.0, Type A-B connectors) available:

- USB-CBL-AB3 (3 ft.)
- USB-CBL-AB6 (6 ft.)
- USB-CBL-AB10 (10 ft.)
- USB-CBL-AB15 (15 ft.)

RS232 Serial Cable

- D2-DSCBL (12 ft. 9-pin D-sub to RJ12 connector)

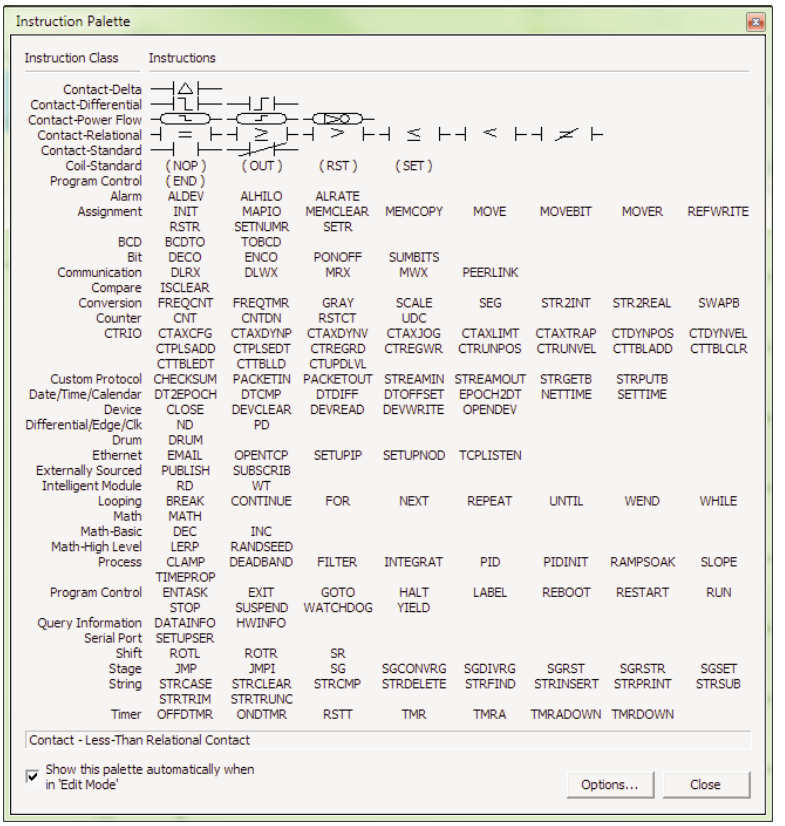
Ethernet Cables (Cat5e)

Automationdirect.com sells many Ethernet patch cables in various colors and lengths. Please check the Cables section in this catalog for further details.

Do-more H2 Series PLC Overview

Do-more PLC Instruction Set

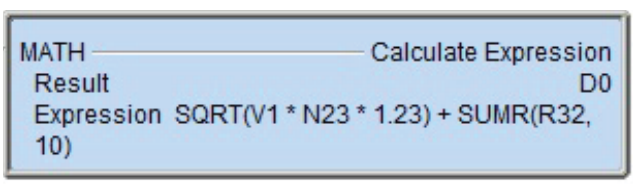
This Instruction Set was developed specifically for the new Do-more PLC; the 'Instruction Palette' displays all available instructions.


Instruction Palette
Instruction Class
Instructions
Contact-Delta
Contact-Differential
Contact-Power Flow
Contact-Relational
Contact-Standard
Coil-Standard (NOP) (OUT) (RST) (SET)
Program Control (END)
Alarm ALDEV ALHILO ALRATE
Assignment INIT MAPIO MEMCLEAR MEMCOPY MOVE MOVEBIT MOVER REFWRITE
RSTR SETNUMR SETR
BCD BCDTO TOBCD
Bit DECO ENCO PONOFF SUMBITS
Communication DLRX DLWX MRX MWX PEERLINK
Compare ISCLEAR
Conversion FREQCNT FREQTMR GRAY SCALE SEG STR2INT STR2REAL SWAPB
Counter CNT CNTDN RSTCT UDC
CTRIO CTAXCFG CTAXDYNP CTAXDYNV CTAXJOG CTAXLIMT CTAXTRAP CTDYNPOS CTDYNVEL
CTPLSADD CTPLSEDT CTREGRD CTREGWR CTRUNPOS CTRUNVEL CTTBLADD CTTBLCLR
CTTBLEDT CTTBLLD CTUPDLVL
Custom Protocol CHECKSUM PACKETIN PACKETOUT STREAMIN STREAMOUT STRGETB STRPUTB
Date/Time/Calendar DT2EPOCH DTCMP DTDIFF DTOFFSET EPOCH2DT NETTIME SETTIME
Device CLOSE DEVCLEAR DEVREAD DEVWRITE OPENDEV
Differential/Edge/Clk ND PD
Drum DRUM
Ethernet EMAIL OPENTCP SETUPIP SETUPNOD TCPLISTEN
Externally Sourced PUBLISH SUBSCRIB
Intelligent Module RD WT
Looping BREAK CONTINUE FOR NEXT REPEAT UNTIL WEND WHILE
Math MATH
Math-Basic DEC INC
Math-High Level LERP RANDSEED
Process CLAMP DEADBAND FILTER INTEGRAT PID PIDINIT RAMPSOAK SLOPE
TIMEPROP
Program Control ENTASK EXIT GOTO HALT LABEL REBOOT RESTART RUN
STOP SUSPEND WATCHDOG YIELD
Query Information DATAINFO HWINFO
Serial Port SETUPSER
Shift ROTL ROTR SR
Stage JMP JMPI SG SGCONVRG SGDIVRG SGRST SGRSTR SGSET
String STRCASE STRCLEAR STRCMP STRDELETE STRFIND STRINSERT STRPRINT STRSUB
STRTRIM STRTRUNC
Timer OFFDTMR ONDTMR RSTT TMR TMRA TMRADOWN TMRDOWN
Contact - Less-Than Relational Contact
Show this palette automatically when in 'Edit Mode'
Options...
Close

You may see some similarities to the DirectLOGIC PLC instruction set. However, the instruction set for the Do-more PLC is more advanced and intuitive. A good example is the MATH instruction. Now, just one MATH instruction covers all math operations and also allows you to mix different data types in one expression.

There are over 60 operators and functions available with the MATH instruction.

Note: To learn more about the MATH instruction, please refer to the Do-more Designer help topic 'MATH – Math Expression'.



Operators

+, -, *, /, %, **, <, <=, ==, !=, >=, >, &&, ||, &, |, ^, <<, >>, >>>, -, ~, !

Functions

ABS, ACOS, ASIN, ATAN, AVGR, COS, COUNTIFEQ, COUNTIFNE, COUNTIFGE, COUNTIFGT, COUNTIFLE, COUNTIFLT, DEG, E, FRAC, IF, LN, LOG, MAXR, MAX, MINR, MIN, NOW, PI, RAD, RANDINT, RANDREAL, REF, ROUND, SIN, SQRT, STDEVR, STDEVPR, SUMIFEQ, SUMIFNE, SUMIFGE, SUMIFGT, SUMIFLE, SUMIFLT, SUMR, TAN, TICKms, TICKus, TOINT, TOREAL, TRUNC

Do-more H2 Series PLC Overview

Data Types

The Do-more PLC supports the following seven primary data types:

- Bit (0 or 1)
- Unsigned Byte (0 to 255)
- Signed Byte (-128 to 127)
- Unsigned Word (0 to 65,535)
- Signed Word (-32,768 to 32,767)
- Signed DWord (-2,147,483,648 to 2,147,483,647)
- Real (-3.4028235E+038 to 3.4028235E+038)

Note: As you can see, the BCD data type that is popular for the DirectLOGIC PLC is not included in this list. However, you can use the BCDTO and TOBCD instructions if you need to use the BCD data type with your application. Those instructions convert the data between the BCD data type and the integer/real data types.

Data Structure

The Do-more PLC supports data structures as additional data types. Structures use the familiar PC programming organization of "dot notation". All available elements of a structure are shown in this format. The following data structures are currently available:

- Timer Structure
- Counter Structure
- String Structure
- PID Structure
- Date/Time Structure
- Task Structure
- Rampsoak Structure
- Program Structure
- DeviceRef Structure
- Drum Structure

The data structure is a set of data. For instance, a Timer structure (Timer Struct) has the following set of data:

- Acc (Accumulated Time, Signed DWord)
- Done (Bit)
- Zero (Bit)
- Timing (Bit)
- Reset (Bit)

When you use a timer instruction (TMR), a Timer structure is assigned to the instruction. If you select 'T0', you can access the above data with dot notation. For instance, to access the accumulated time (Acc), enter 'T0.Acc'. To access the Done bit, enter 'T0.Done'.

Memory Addressing

With the Do-more PLC, each memory address type has its own specific data type. Here are some examples:

- V (Unsigned Word)
- N (Signed Word)
- D (Signed DWord)
- R (Real)

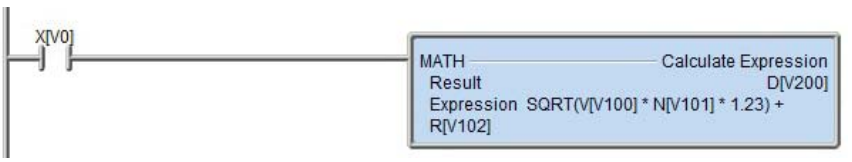
If you see address 'V123' in the ladder program, the memory address always stores an Unsigned Word value. With this memory addressing method, it becomes easier to read and write the ladder programs.

Although most of the memory addressing is decimal, the memory addresses DLX, DLY, DLC and DLV use octal. These four memory addresses can be used to exchange data with DirectLOGIC PLCs, which use octal memory addressing.

Do-more H2 Series PLC Overview

Array Addressing

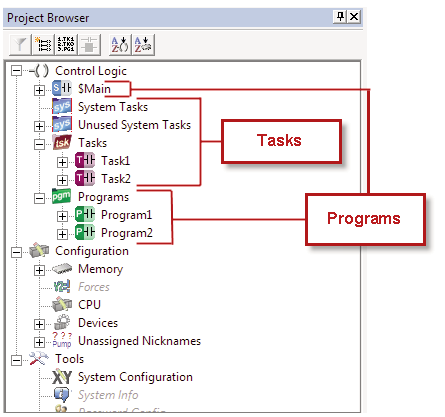
The Do-more PLC supports array addressing with all memory addresses. V-memory address must be used as the index for an array. With the Do-more PLC, the following ladder program is valid.



Note: In this example, V0, V100, V101, V102 and V200 are indices.

Code-block, Program and Task

One Do-more project can consist of more than one ladder program. Each ladder program is called a 'Code-block'. The Do-more PLC supports two types of code-blocks, Program and Task. Here are their definitions.



Program

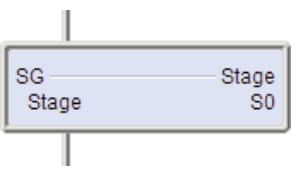
Programs are code-blocks that run based on an event using the RUN instruction. They can be self-terminating or never terminate. Stage programming is only supported inside Program code-blocks.

Task

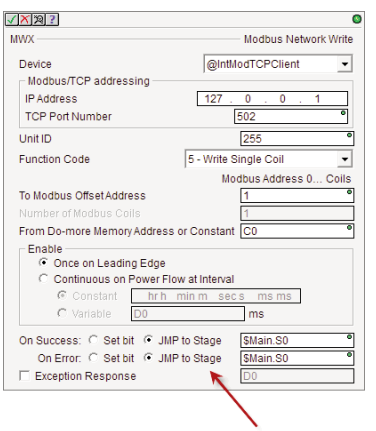
Tasks are code-blocks that are enabled and disabled using the ENTASK instruction. The ENTASK instruction allows you to specify an interval to execute the task's logic with a millisecond resolution or to execute a single time on a leading edge input.

Stages

The Do-more PLC supports Stages. You can use Stages only in the Program code-blocks. (They are not available in the Task code-blocks.) The Do-more PLC supports the following instructions for Stage Programming[1]:



- SG (SG)
- JMP (Jump To Stage)[2]
- JMPI (Index Jump)
- SGSET (Enable Stage)
- SGRST (Disable Stage)
- SGRSTR (Disable Range of Stages)
- SGCONVRG (Converge Multiple Stages to SG)
- SGDIVRG (Jump to Multiple Stages)



[1] There is no ISG (Initial Stage) instruction for the Do-more PLC; the first stage in the Program code-block becomes the initial stage automatically.

[2] Many asynchronous instructions can directly initiate a Jump to Stage.

Do-more H2 Series PLC Overview

Comparison with the DL205 PLC

The following spec table shows the major differences between the Do-more H2 Series PLC and the DL205 PLC.

	Do-more H2 Series PLC	DL205 PLC
Instruction Set	Do-more PLC instruction set	DirectLOGIC PLC instruction set
Total Memory Bytes	262.1K	30.4K
Default Data Type	Decimal and Real (Data can be referred in different data types with the 'Casting' feature.)	BCD, HEX and Real
Memory Addressing	Decimal mainly (There are some octal memory addresses to exchange data with DirectLOGIC PLCs easily.)	Octal
User-defined Memory Addresses	Yes	No
Bit of Memory	Available for all memory addresses (e.g. V100.2, D200.3)	Yes, D2-250(-1) and D2-260 only
Array Addressing	Available for all memory addresses (e.g. X[V100], D[V200])	Available only for V-memory addresses (e.g. P2000)
Math Calculation	No accumulator, the MATH instruction can support a mix of different data types.	Using accumulator or using the MATHBCD, MATHBIN or MATHR instruction for each data type.
Number of Code Blocks	1 system program 6 system tasks Up to 256 user programs Up to 256 user tasks	1
Looping	FOR-NEXT, WHILE-WEND, REPEAT-UNTIL	FOR-NEXT
Subroutines	No (Use Code-blocks)	Yes
User Document (Nicknames, Rung Comments…) Storing	Stored in the CPU module	No (Stored on PC only)
Password Protection	Multiple passwords	Single password
Run-time Editing	Bumpless	Ladder program execution is paused during the ladder program transfer in RUN mode.
Analog I/O Configuration	The X, WX and WY addresses are assigned to analog I/O channels automatically. (Manual addressing is available also.)	Configured by ladder program
Local Base Expansion	No	Yes (with D2-EM and D2-CM)
Number of PID Loops	Over 2000	4 (D2-250-1), 16 (D2-260)
Memory Back-up Battery	Included	Optional
Firmware Update	CPU module firmware can be updated from Do-more Designer.	Use firmware update tool
Built-in RS-232 Port	Yes, Full duplex	Yes, Half duplex
Built-in USB Port	Yes	No
Built-in Ethernet Port	Yes (H2-DM1E)	No
Programming Software	Do-more Designer	DirectSOFT

Dimensions and Installation

Understanding the installation requirements for your Do-more H2 Series PLC system will help ensure that the components operate within their environmental and electrical limits.

Plan for safety

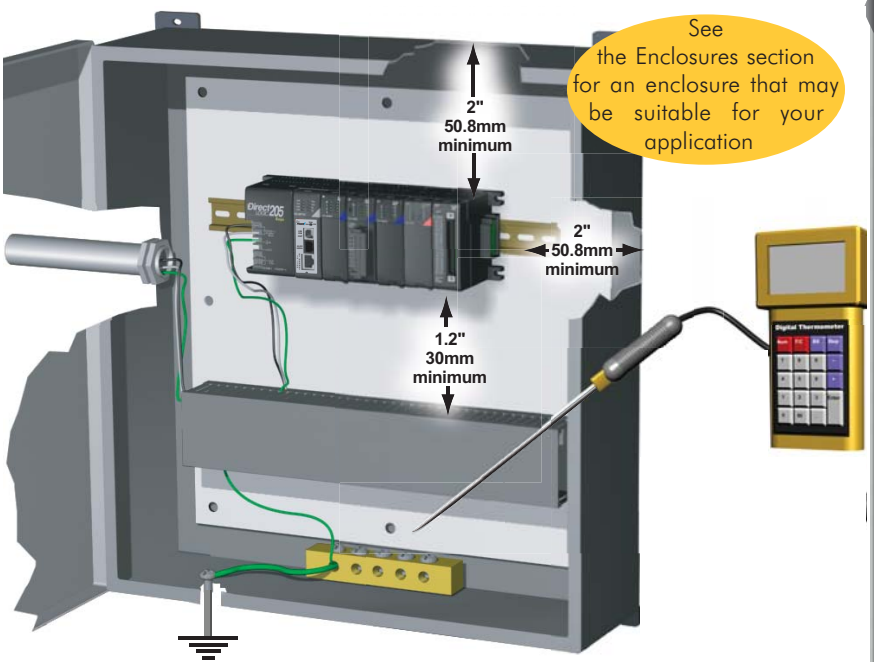
This catalog should never be used as a replacement for the user manual. The user manual, H2-DM-M (sold separately or downloadable online), contains important safety information that must be followed. The system installation should comply with all appropriate electrical codes and standards.

Environmental specifications

The Environmental Specifications table at the right lists specifications that apply globally to the Do-more H2 Series PLC system (CPUs, bases, and I/O modules). Be sure that the system is operated within these environmental specifications.

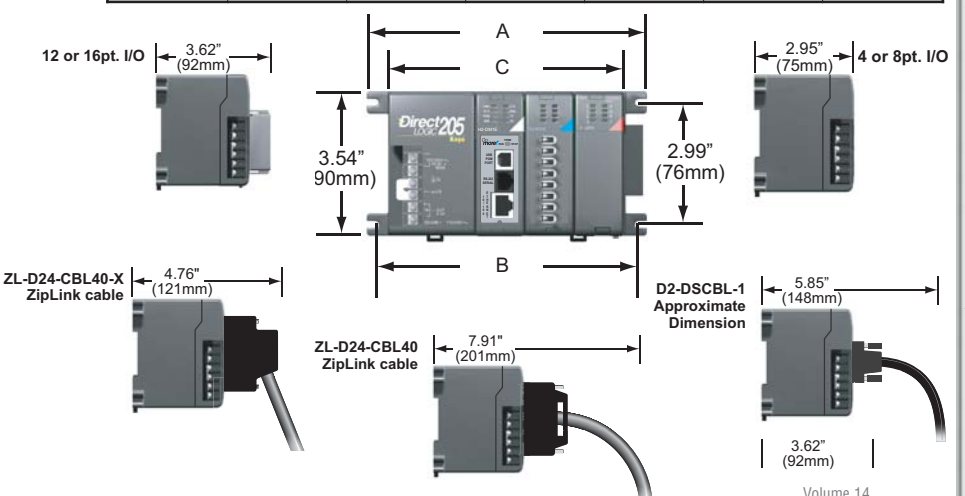
Base dimensions and mounting

Use the diagrams below to make sure the Do-more H2 Series PLC system can be installed in your application. To ensure proper airflow for cooling purposes, bases must be mounted horizontally. It is important to check these dimensions against the conditions required for your application. For example, it is recommended that approximately 3" of space is left in front PLC surface for ease of access and cable clearances. Also, check the installation guidelines for recommended cabinet clearances.



Environmental Specification	Rating
Storage Temperature	-4°F - 158°F (-20°C to 70°C)
Ambient Operating Temperature	32°F - 131°F (0°C to 55°C)
Ambient Humidity	30%-95% relative humidity (non-condensing)
Vibration Resistance	MIL STD 810C, Method 514.2
Shock Resistance	MIL STD 810C, Method 516.2
Noise Immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases

Base	A (Base Total Width)		B (Mounting Hole)		C (Component Width)	
	Inches	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
3-slot	6.77”	172mm	6.41”	163mm	5.8”	148mm
4-slot	7.99”	203mm	7.63”	194mm	7.04”	179mm
6-slot	10.43”	265mm	10.07”	256mm	9.48”	241mm
9-slot	14.09”	358mm	13.74”	349mm	13.14”	334mm



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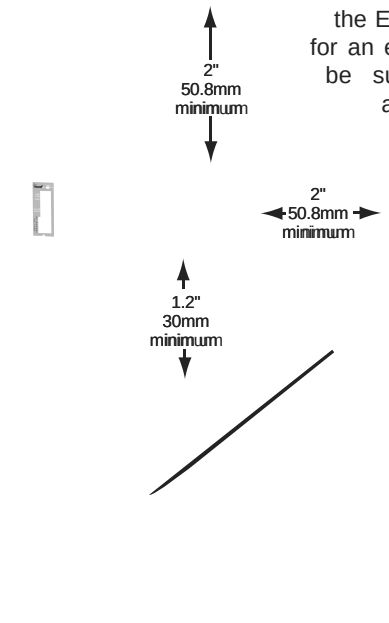

See the Enclosures section for an enclosure that may be suitable for your application

Environmental Specification	Rating
Storage Temperature	-4°F - 158°F (-20°C to 70°C)
Ambient Operating Temperature	32°F - 131°F (0°C to 55°C)
Ambient Humidity	30%-95% relative humidity (non-condensing)
Vibration Resistance	MIL STD 810C, Method 514.2
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Noise Immunity	NEMA (ICS3-304)
Atmosphere	No corrosive gases

Base	A (Base Total Width)		B (Mounting Hole)		C (Component Width)	
	Inches	*Millimeters*	*Inches*	*Millimeters*	*Inches*	*Millimeters*
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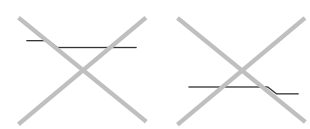
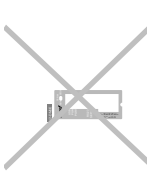
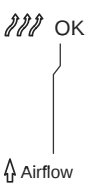
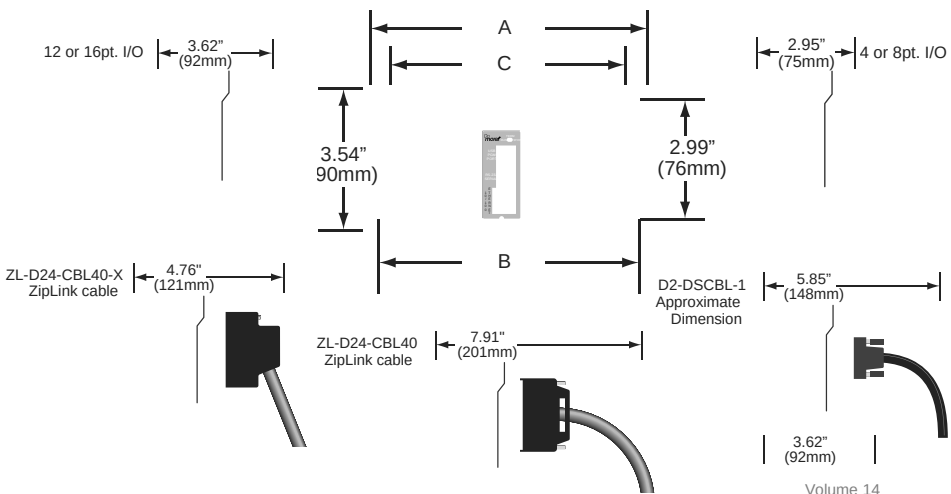








SUNFORCE®

600 Watt MARINE WIND TURBINE

User's Manual

Congratulations on your Sunforce Purchase. This product is designed to the highest technical specifications and standards. It will supply years of maintenance free use. Please read these instructions thoroughly prior to installation, then store in a safe place for future reference. If at any time you are unclear about this product, or require further assistance please do not hesitate to contact our trained professionals operating the customer support line 1-888-478-6435 or email to info@sunforceproducts.com

The Sunforce 600 Watt Marine Wind Turbine is designed for watercrafts and any area in close proximity to salt water. The heavy-duty powder-coating adds enhanced resistance to the effects of the sun, wind, and water. All components have been tested to perform, without degradation under marine conditions.

1. SAFETY

Your Sunforce 600 Watt Wind Turbine is designed with your personal safety as the first priority. However, there are still some inherent dangers involved with any electrical and/or mechanical equipment.

Safety must be the primary concern as you plan the location, installation and operation of the turbine. Please read the following:

Important Safety Instructions

Please take the time to read through this manual prior to assembly.

1) Place this instruction manual in a safe place for reference.
2) Wait until a calm day to install or perform maintenance on your Turbine.
3) Listen to your Turbine should you hear any mechanical noise, maintenance may be required, please contact Sunforce Products Customer Service.
4) After installation re-adjust and tighten the screws and bolts.
5) Adhere to proper grounding techniques as established by the NEC.
6) Your Sunforce Wind Turbine must be installed in accordance with this manual and local and national building code. Incorrect installation may void your warranty.
7) Wind turbine blades spin at a potentially dangerous speed this must be respected. Never approach a turbine in motion.
8) Note wire size (gauge chart included) prior to wiring. Any under sizing of wire can be potentially dangerous.

1.1 Mechanical Hazard

Rotating blades present the most serious mechanical hazard. The rotor blades are made of very strong thermoplastic. At the tip, the blades may be moving at velocities over 15m/s. At this speed, the

tip of a blade is nearly invisible and can cause serious injury. Under no circumstances should you install the turbine where a person could come in contact with moving rotor blades.

1.2 Electrical Hazard

The 600W Turbine is equipped with sophisticated electronics designed to provide protection from electrical dangers. Please note that the inherent personal dangers from electrical current still exist, therefore caution should always be used when connecting this and other electrical devices.

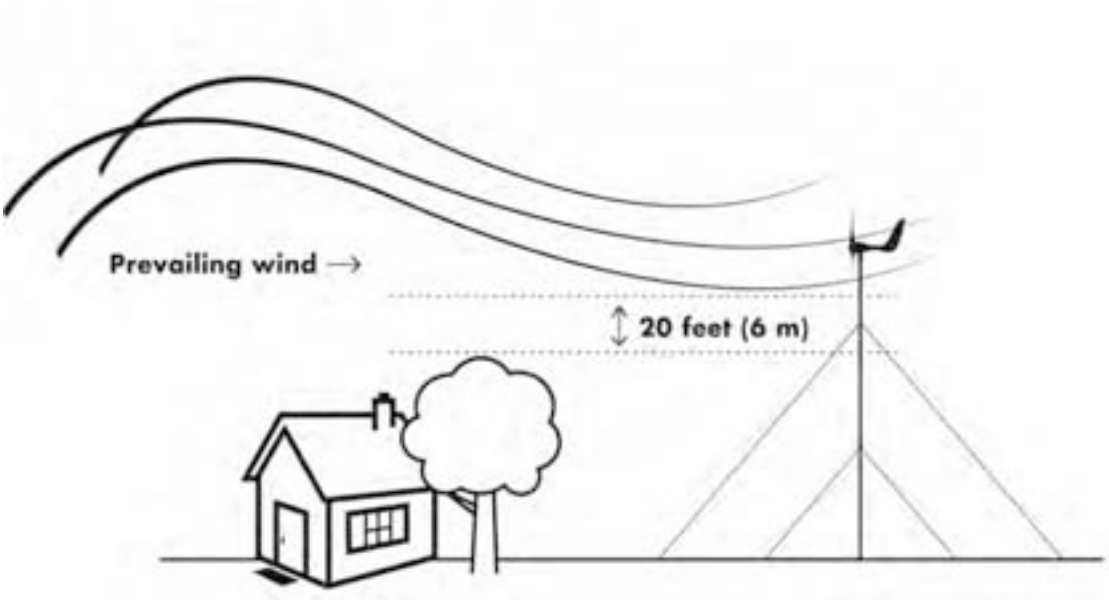
Heat in a wiring system is often a result of too much current flowing through an undersized wire or through a bad connection. Please consult wire guide table below.

Choosing your Sunforce 600 Watt Wind Turbine's location

Prior to the mounting of your Sunforce 600 Watt Wind Turbine, you must carefully consider a location. Things to consider when thinking about your location:

A) Distance from any obstacles that will cause turbulence, trees, buildings etc.
B) Distance from MPPT controller and battery bank
C) Any local zoning restrictions
D) Clearance of power lines
E) When mounting on a boat, be aware of moving objects that may obstruct the turbines blades.

In general terms the higher the tower the less obstruction to air flow, leading to a more efficient charge capacity. The minimum recommended tower height is 30 ft or 20 ft above nearby obstructions for land installations as shown below.



2. MODEL AND SPECIFICATION TABLE

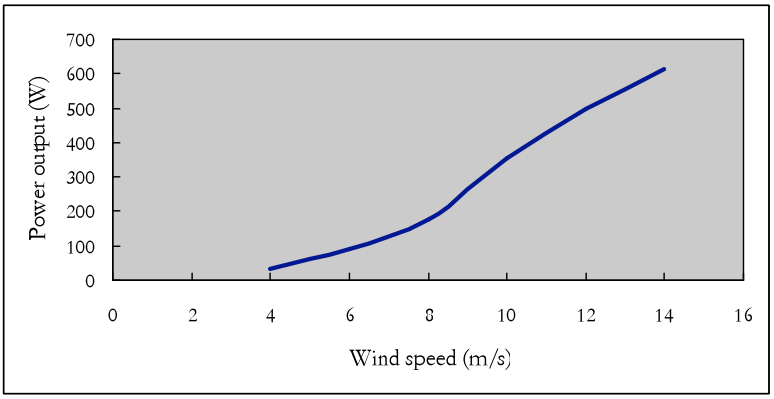
2.1 Specification Table

Model	600W Marine Turbine
Related speed	12.5 m/s (41 ft/s)
Related power	600 W **#**
Voltage with MPPT	12 or 24 V **##**
Rotor diameter	0.65 m (2.1 ft)
Cut-in wind speed	4.5 MPH
Survival wind speed	157 MPH
Number of Blades	3
Blade material	Fiber glass
Suggested battery capacity	>100 A/Hr

2.2 Performance specifications

The following power curve shows the performance you should expect from your wind turbine. During smooth, steady wind speed, you can expect to see output resembling the curve illustrated below. To convert between power and current use the following formula:

POWER = VOLTAGE × AMPS



3. Digital-controlled MPPT Wind Power Charger

Please see included Manual for your MPPT Charge Controller.

- ✓ MCU fully digital-controlled MPPT wind power charger.
- ✓ SEPIC conversion, large DC input voltage range.
- ✓ Smart load management function, braking function.

Rated Output Power :	600W Max.
Battery Voltage Range:	12V or 24V DC
Input Voltage Range	5~75 Vrms
Charger Efficiency:	>87%
Battery Protection Voltage:	12V - 14.4V(Lead-acid batteries) or 15.8V(deep-cycle Battery) 24V - 28.8V (Lead-acid batteries) or 30V (Deep-cycle batteries)
Rated Load Current:	35A Max.
Over-Speed Braking:	≦1400 rpm

Caution: Please review the following wire gauge table to install the correct wire gauge. Sunforce recommends these as the minimum wire sizes for optimal performance.
Always use the largest gauge wires that are practical and affordable. Local, state, and or national electrical codes take precedence over these general recommendations.

12 Volt Systems, AWG / Metric Wire Size mm²

Number of Turbines:	0-30 ft (0-9 m)	30 ft-60 ft (9-18 m)	60 ft-90 ft (18-27 m)	90 ft-150 ft (27-46 m)	150 ft-190 ft (46-58 m)	190 ft-250 ft (58-76 m)	250 ft-310 ft (76-95 m)	310 ft-390 ft (95-119 m)	390 ft-500 ft (119-152 m)
1	8/10 mm²	6/16 mm²	4/25 mm²	2/35 mm²	1/50 mm²	0/50 mm²	00/70 mm²	000/90 mm²	000/90 mm²
2	6/16 mm²	4/25 mm²	1/50 mm²	00/70 mm²	000/90 mm²	0000/120 mm²	***	***	***
3	4/25 mm²	2/35 mm²	0/50 mm²	000/90 mm²	0000/120 mm²	***	***	***	***

*** If your system requires this length of wire, consider using parallel wires.

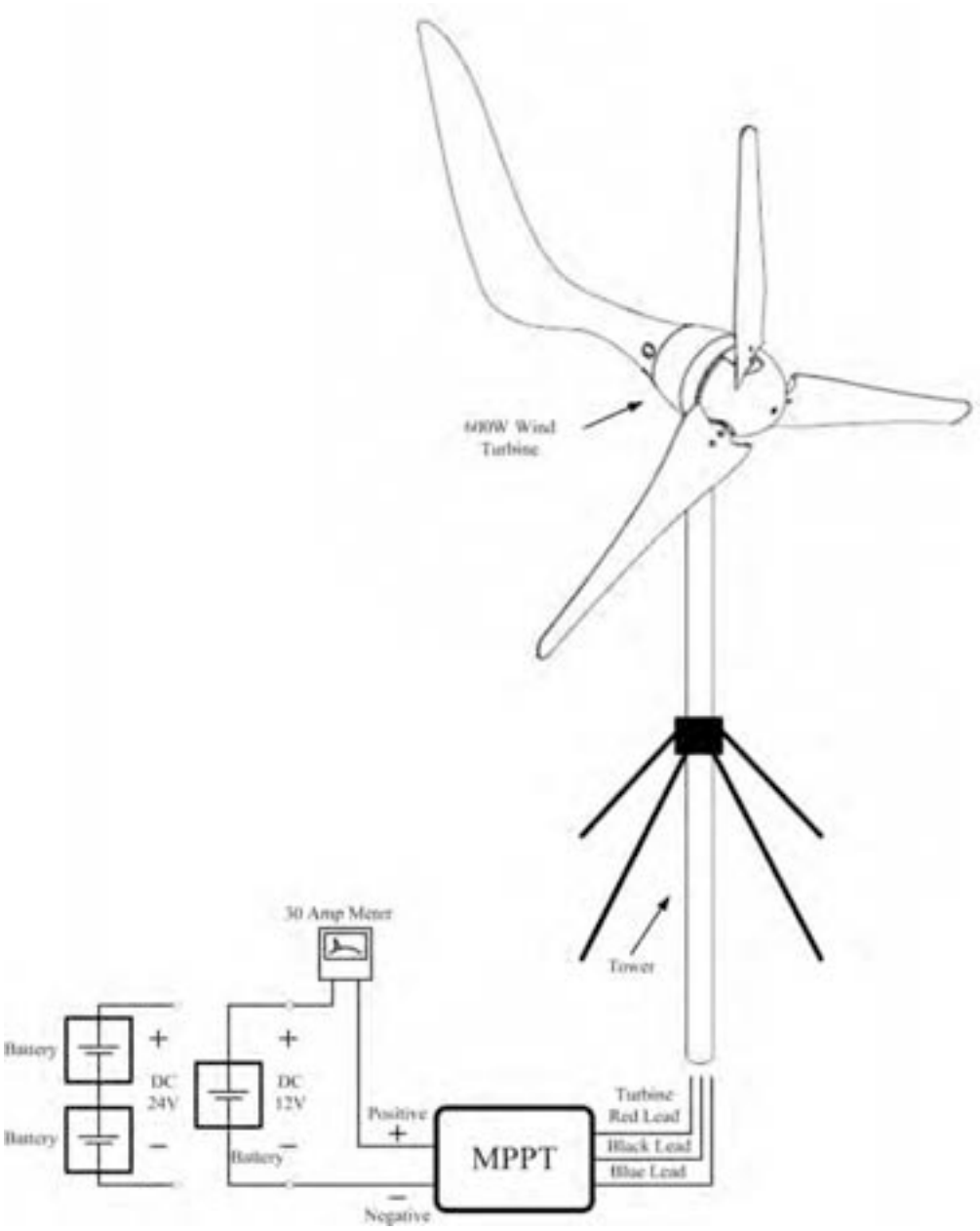
24 Volt Systems, AWG / Metric Wire Size mm²

Number of Turbines:	0-30 ft (0-9 m)	30 ft-60 ft (9-18 m)	60 ft-90 ft (18-27 m)	90 ft-150 ft (27-46 m)	150 ft-190 ft (46-58 m)	190 ft-250 ft (58-76 m)	250 ft-310 ft (76-95 m)	310 ft-390 ft (95-119 m)	390 ft-500 ft (119-152 m)
1	14/2.5 mm²	12/4 mm²	10/6 mm²	8/10 mm²	6/16 mm²	4/90 mm²	4/90 mm²	000/90 mm²	000/90 mm²
2	12/4 mm²	8/10 mm²	6/16 mm²	4/25 mm²	4/25 mm²	2/35 mm²	2/35 mm²	1/50 mm²	0/50 mm²
3	10/6 mm²	8/10 mm²	6/16 mm²	4/25 mm²	2/35 mm²	2/35 mm²	1/50 mm²	0/50 mm²	00/70 mm²

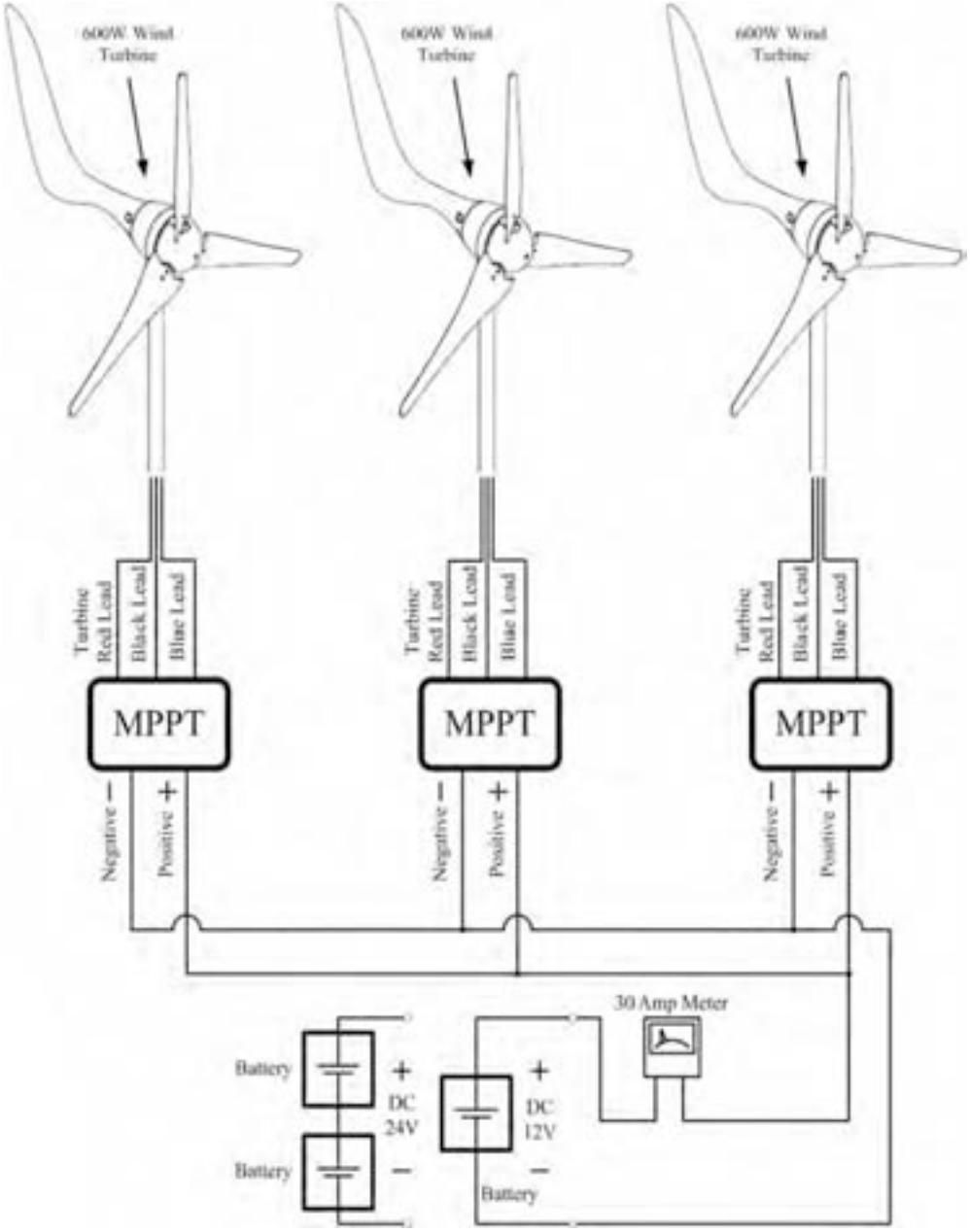
3.*1 System wiring diagrams*

There are multiple options to connect your Wind Turbine dependant on your power requirements and available components.

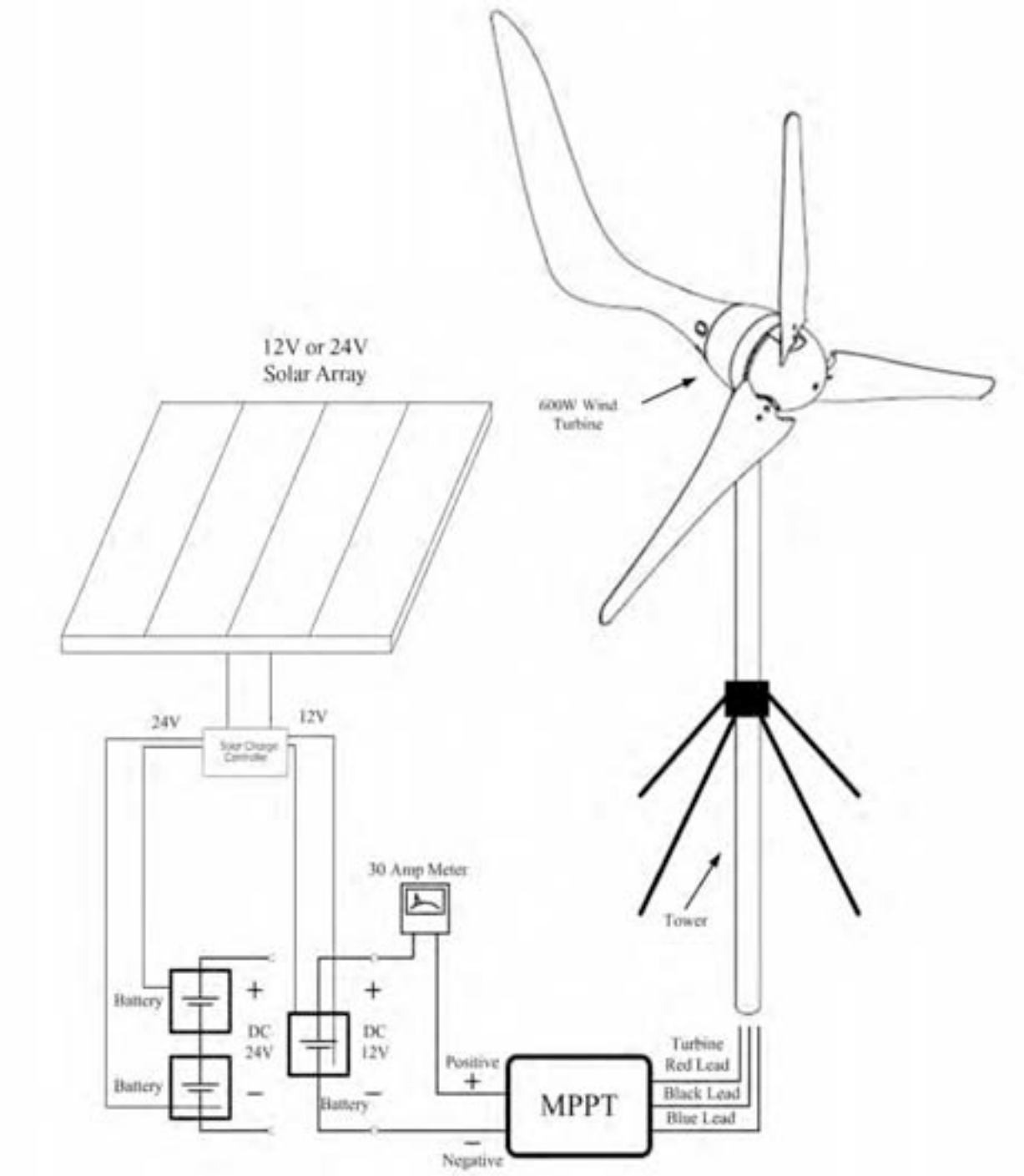
Single Turbine installation:



Multiple Turbine installation:



Hybrid Solar/Wind System

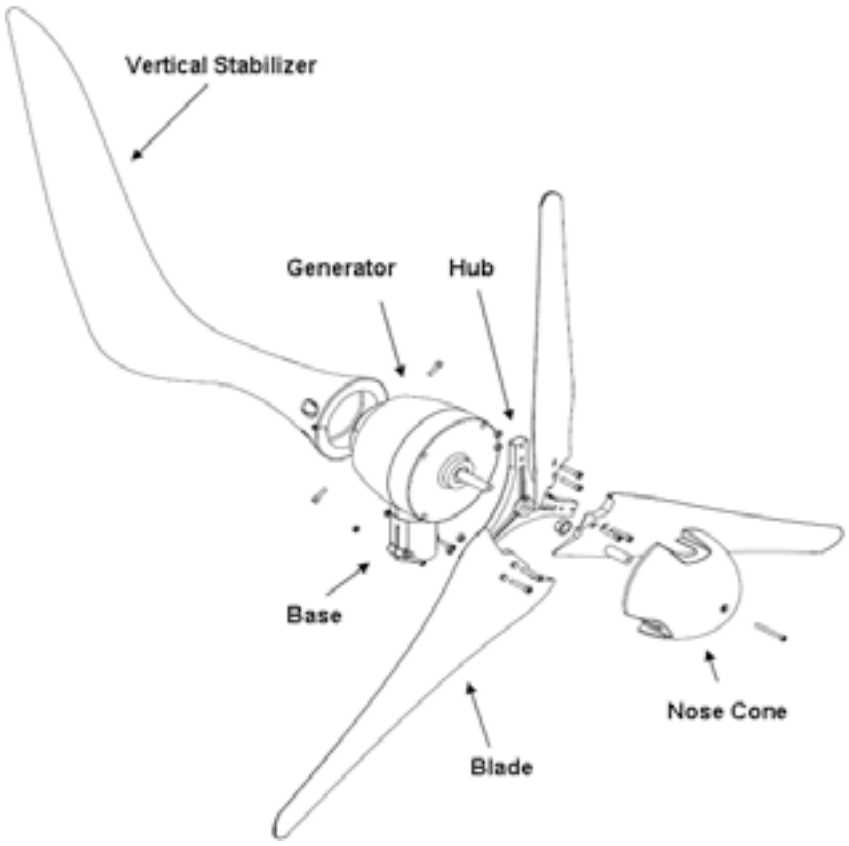


A typical “hybrid” system (Photovoltaic and Wind combined) is wired as follows
Whenever feasible wire the turbine and solar panels to their own set of battery terminals.

4. PACKAGE CONTENTS

Check the parts listed with the contents of the box and make sure that you have everything needed for assembly.

Figure 1



Caution: The edges of the blades are sharp. Please handle with care.

Name		Quantity
Turbine		1
Blades		3
MPPT Charge Controller		1
Hub		1
Vertical Tail		1
Nose Cone		1
Amp Meter		1
	Nut (M14xP2.0)	1
	Hex Screw(M6xL30)	6
	Nut (M6)	6
	Hex Screw (M5xL12)	1

Screw Pack	Spring Washer (M14)	1
	Stop Screw (M5xL20)	1
	Hex Sleeve	1
	Hex Key no.5	1
	Hex Key No.3	1
	Rubber Spacer	1
	Hex Screw (M5xL20)	4
	Washer (M5)	4
Replacement Screw Pack	Nut (M14xP2.0)	1
	Hex Screw (M6xL30)	6
	Nut (M6)	6
	Hex Screw (M5xL12)	1
	Spring Washer (M14)	1
	Rubber Spacer	1
	Hex Screw (M5xL20)	4
	Washer (M5)	4
	Stop Screw (M5xL20)	1

5. INSTALLATION PROCEDURE

Step1: Open box to ensure all parts are present, remove the hub from the box.

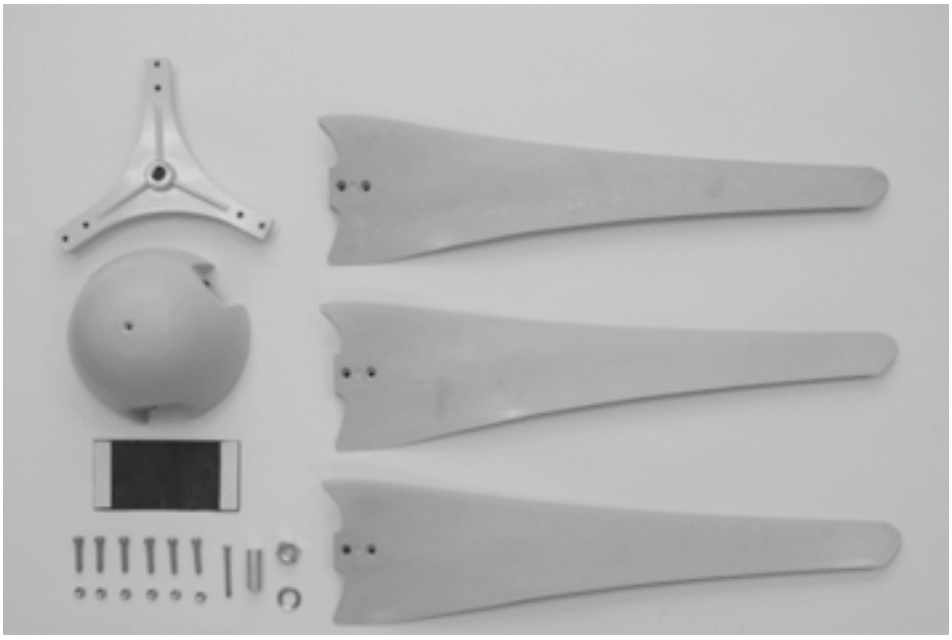


Figure 2

Step2: Take out the blades from box and fasten the blades on hub with nuts.

Figure 3

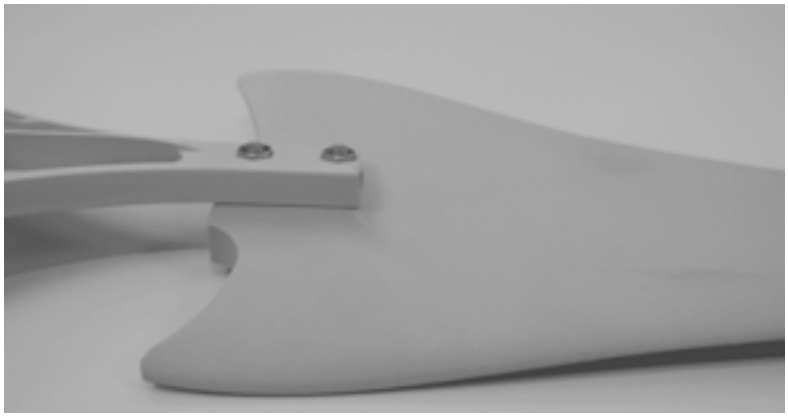


Figure 4

Caution: Make sure that all of the bolts are secured with nuts.

Step 3: How to install the hub.

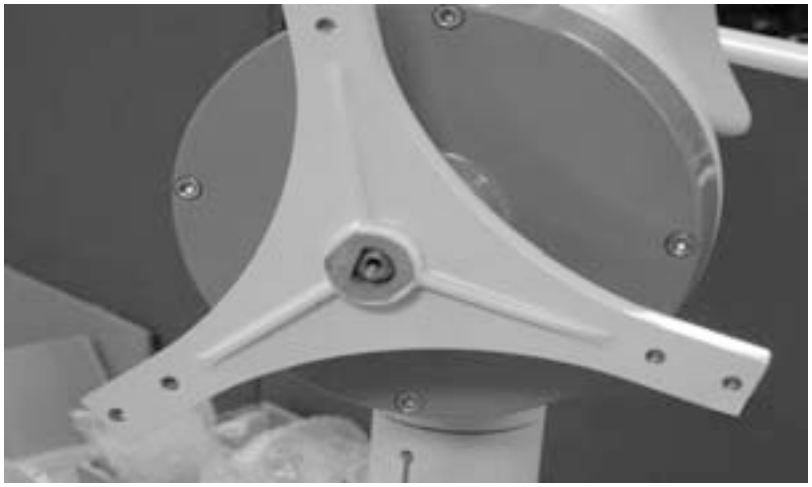


Figure 5

Adhesive strip should be wrapped around your Tower (not included) to increase secure connection to the Yaw shaft.

Step 4: Take out the wind turbine from box and put the cables through the mast.

Figure 6

Step 5: To install the wind turbine to your chosen tower (not included) securely fasten the bolt by using the hex wrench.

Figure 7

Step 6: Install the hub on the wind turbine using M14 nut and spring washer.

Figure 8

Figure 9

Caution: Make sure the nut is secured with the spring washer.

Step7: Put the sleeve inside the nose cone and fasten the nose cone to the hub. Apply pressure to the connections to ensure a secure fit.

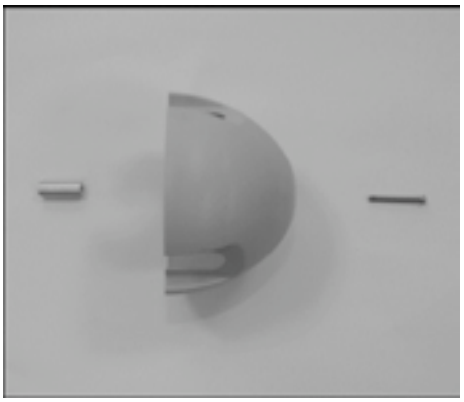


Figure 10

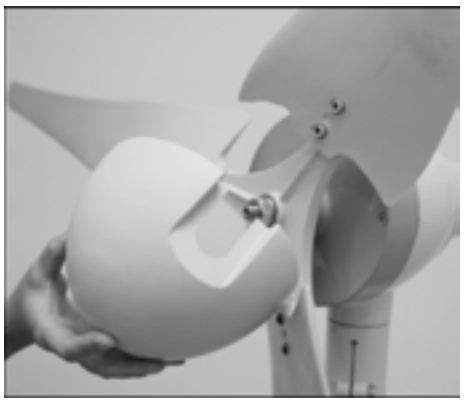


Figure 11

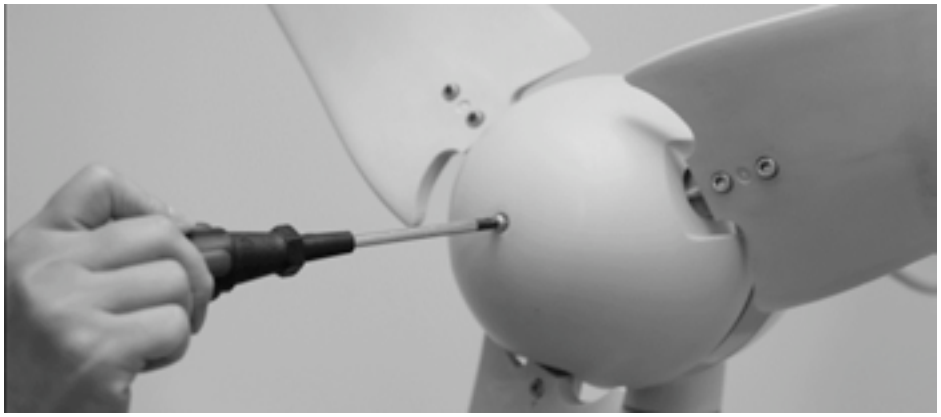


Figure 12

Step 8: Tail Fin assembly. Use the four supplied HEX screws, to firmly connect the Tail Fin to the hub.

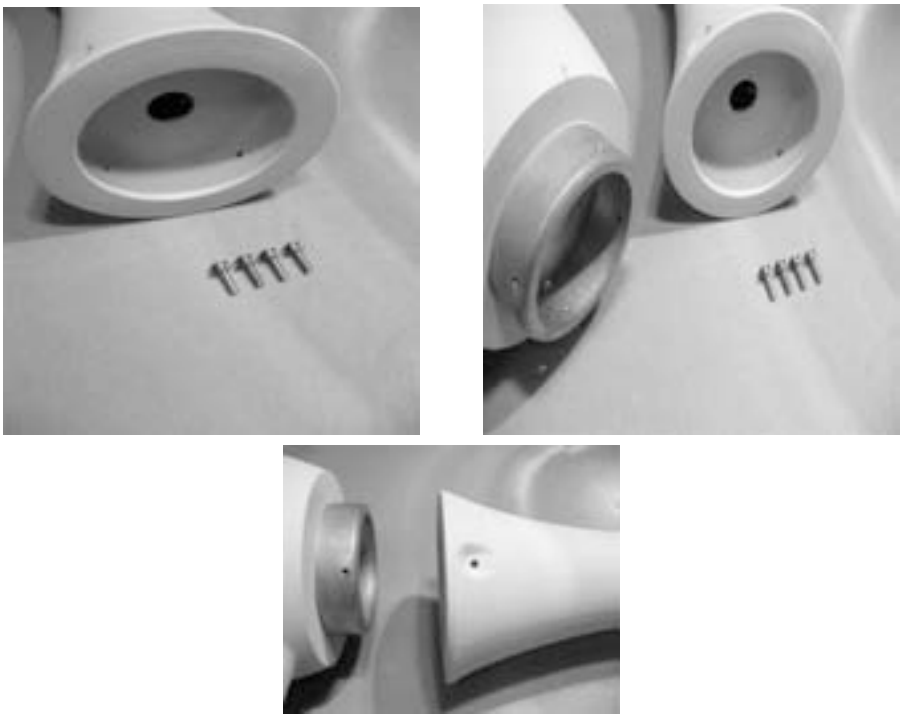


Figure 13

6. MAINTENANCE

Your Sunforce Products 600 Watt Wind Turbine has been designed to run for long periods without requiring any maintenance. Performance will be enhanced if you periodically inspect your system. Review the following simple maintenance procedures and implement every six months.

Caution: Do not go near the wind turbine during operation.
Caution: The blades are sharp. Please handle with care.

• Check blades for superficial damage. Replace blades if damaged. It is important to not use blades that are damaged, as you will lose overall balance, resulting in a decrease in efficiency. Should you notice damage to the blades you must replace all 3. The blades are balanced as sets.
• Check the blade bolts and the hub nut for tightness.
• Check nosecone for cracks and tighten nuts.
• Wipe any excess dirt build-up from the blades.
• Check all electrical connections to make sure they are tight and free from corrosion.
• Check the voltage of your battery bank with a Multi-meter and clean the terminals.
• Sunforce Products suggests replacing the blades every five years for optimal performance.

7. FAQS

(1) How does the *Sunforce Products 600 Watt Wind Turbine* control power and RPM in high winds?
Your Turbine's operation will be halted to reduce the risk of damage due to overcharge and over spin

of the rotor blades. This process of braking is handled internally through your Turbines electronics.

(2) What is the maximum wind speed the *Sunforce Products 600 Watt Wind Turbine* will survive, and do I need to take it down in a storm?
Your wind turbine is designed to operate in *most* climatic conditions. Should you expect or experience winds of 150MPH upwards, please turn off the MPPT controller which will in turn manually apply the braking system to protect from any over spin. Once the Turbine has stopped it is possible to lay down the Tower to offer further protection.

(3) How long will the bearings or other wearing parts last?
According to engineering calculations, the bearings should have a 10-year life span in 12- mph (6 m/s) average wind speed sites. Bearing life will vary from one application to another; however, you should expect at least a five-year performance in adverse conditions and 10 years in normal conditions.

(4) Can the *Sunforce Products 600 Watt Wind Turbine* be connected in reverse-polarity to the battery without causing any damage?
Reverse polarity will cause damage to both your MPPT controller and battery if not quickly remedied. Always double check any wiring to reduce the risk of reverse polarity. Your turbine is equipped with polarity protection to reduce the risk of damage, but it is still possible to degrade your wiring and cause damage to the overall system.

(5) Will it hurt my *Sunforce Products 600 Watt Wind Turbine* to short-circuit the output?
No, the *Sunforce Products 600 Watt Wind Turbine* is designed to be short-circuited as a normal shutdown procedure by a fuse. The function of the stop switch is to both disconnect the turbine from the batteries as well as short-circuit the output of the turbine.

(6) Where can I locate tubing to make a tower?
Your *Sunforce Products 600 Watt Wind Turbine* is designed to make mounting as simple and straightforward as possible. Should you not wish to purchase the custom tower kit feel free to utilize schedule 40 1.5 inch steel tubing. This should be available through your local hardware outlet.

(7) What is the difference between copper and aluminum wire?
Generally aluminum wire is less conductive, so it must be bigger for the same amp load and resistive losses as copper. *Sunforce Products 600 Watt Wind Turbine* uses copper or tinned copper for the yaw wires.

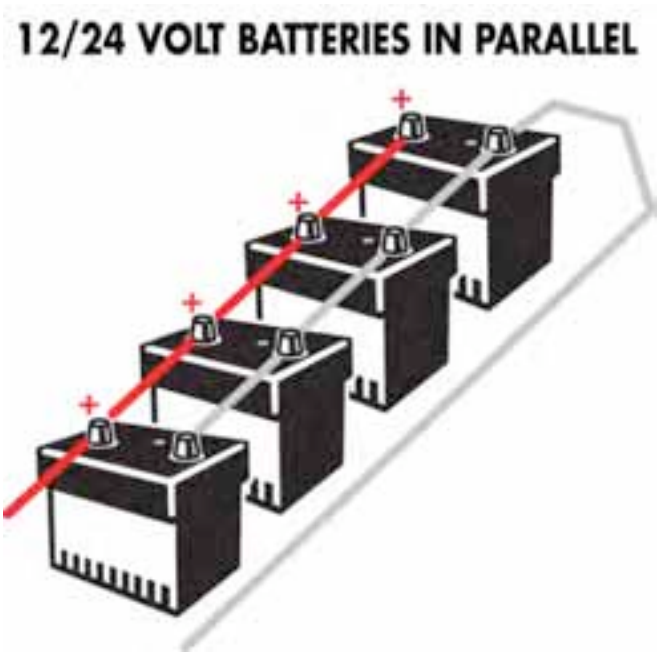
(8) What battery should I choose for my *Sunforce Products 600 Watt Wind Turbine?*
There are multiple battery options in today's market– flooded lead acid, absorbed Glass mat (AGM), gel cell and NiCad. There is no definitive choice for your alternative energy needs. Normally the

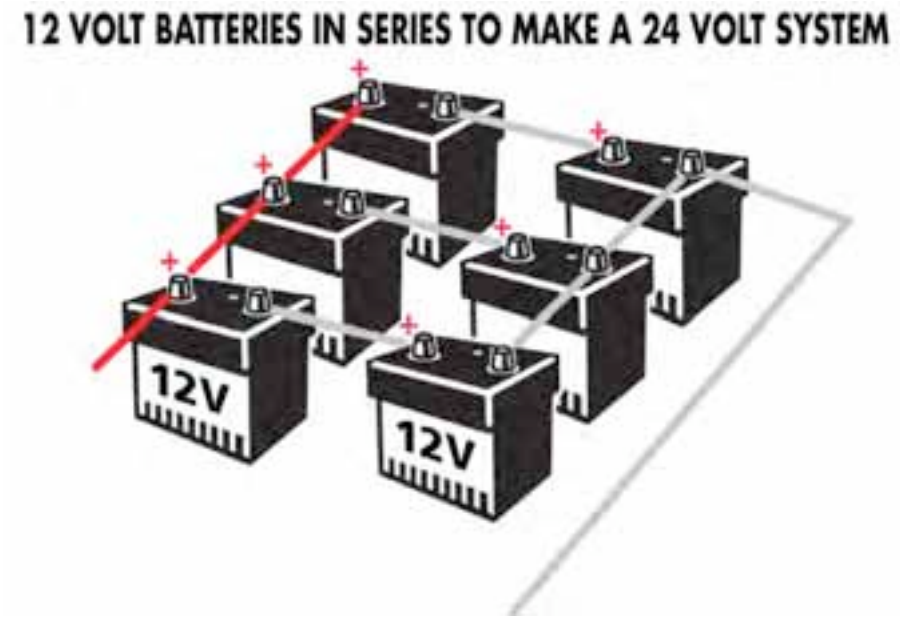
choice of battery is determined by availability and pricing. Should you have questions regarding batteries please consult a local battery supplier. Or view: www.batterycouncil.org. The capacity of your battery bank is determined by your use. Below is a good guideline.

• 12-volt systems – 400 Amp-hours
• 24-volt systems – 200 Amp-hours

(9) Is my *Sunforce Products 600 Watt Wind Turbine* protected from salt corrosion?
Yes. All components have been rigorously tested to perform under marine conditions.

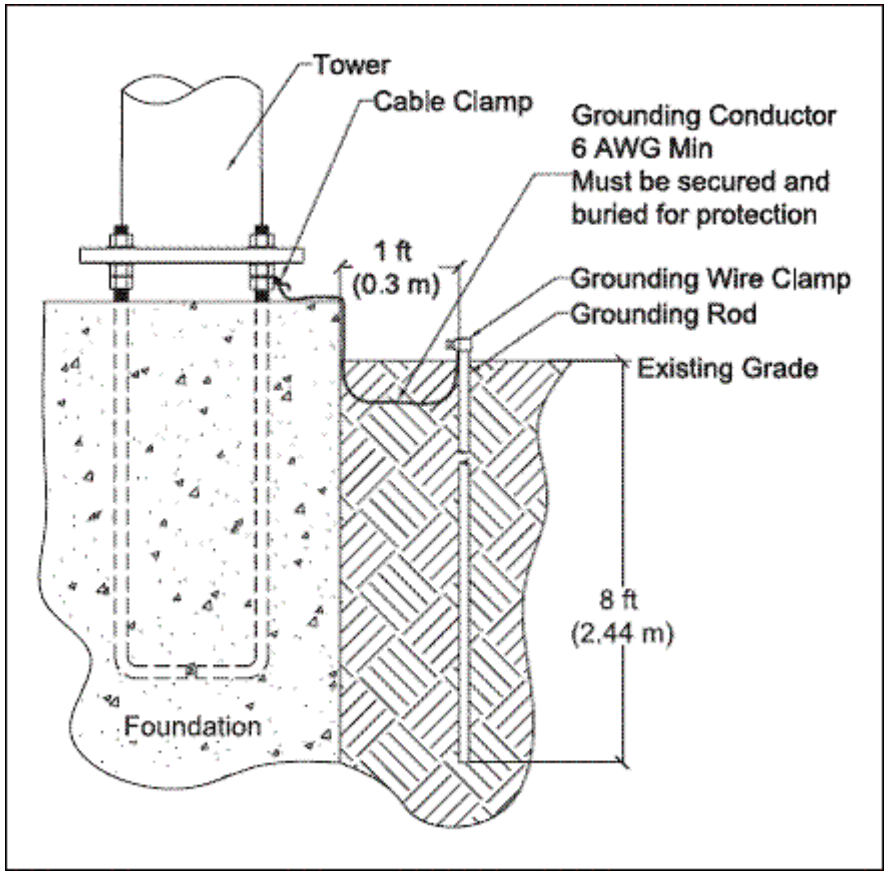
Possible Battery Configurations (suggested)





(9) Is lightning protection necessary?
You should ground your Sunforce Products 600 Watt Wind Turbine. Proper grounding (illustrated below) provides protection to individuals and equipment by eliminating the possibility of dangerous voltage. Remember a steel tower is a conduit for lightning.

Every wind turbine and turbine tower needs to be grounded at the tower base
even though the system may be grounded at the battery bank. Grounding the tower at its base may help prevent shocks to persons touching the tower due to lightning or electrical faults.
Please take the time to review the National Electrical Code (NEC) and local
building and zoning regulations for complete requirements. Even in “Off Grid Systems”
There are multiple ways for tower grounding, the most common method is a copper clad steel electrode(s) driven into the soil. Please view the following grounding diagram.



(10) What effect does radio interference have on my *Sunforce Products 600 Watt Wind Turbine*?
The internal circuitry of the *Sunforce Products 600 Watt Wind Turbine* is shielded and filtered to prevent radio interference, and has been tested to insure electro-magnetic compatibility.

(11) What effect does my *Sunforce Products 600 Watt Wind Turbine* have on radio transmissions?

The *Sunforce Products 600 Watt Wind Turbine* normally does not affect radio transmitters. Care should be taken, however, to route power lines from the *Sunforce Products 600 Watt Wind Turbine* away from the power and antenna lines of a radio transmitter. An old ham radio operator's trick is to twist positive and negative wires together to provide an even distribution of EMF noise across both wires, which serves to cancel out the electrical noise created. This technique can be used on the *Sunforce Products 600 Watt Wind Turbine* power lines, on the radio's power lines, and on transmission wires. Transmission lines should always be kept as far from power lines as is practically possible. Proper grounding of the Turbine and other system components must also be observed.

(12) Will it affect the regulation of my *Sunforce Products 600 Watt Wind Turbine* to install an RF (radio frequency) filter?
An RF filter should not affect the regulation of the Turbine, but any electronic devices placed in line with the turbine must be rated for the proper current and voltage. It is best to place any line filters on the power lines for the load device that requires it, and as close to the device as possible.

Trouble shooting

You may require an extra person to assist with these tests.

1) Remove the blade/hub from the turbine. Replace the rotor hub nut on the rotor shaft.
2) Quickly spin the rotor shaft manually with your fingers while connecting and disconnecting the red and black wires (turbine must not be connected to batteries).
3) With the red and black wires connected to each other, the shaft should be more difficult to turn. When the wires are disconnected it should spin freely.
Should this not be true please contact supplier or Sunforce Products.
4) With your 600 Watt Wind Turbine connected to your battery bank, use an electric hand drill to spin the rotor shaft.
5) Below 500 RPM, the rotor should spin freely without friction.
6) At 500 RPM and above, the Wind Turbine should be charging the battery. You should feel resistance on the rotor shaft if the shaft is not rotating; contact your turbine dealer or Sunforce Products. Be aware your battery banks needs to be under 12V or 24V for this testing as the Turbine needs to read a charge.

Warranty

Sunforce Products warrants your product to be free from defects in material and/or workmanship for a period of 5 years from original date of purchase. Warranty coverage is extended only to customer (original purchaser). If product proves defective during warranty period, Sunforce Products, at its option will:

1. Replace wind turbine with new or refurbished product.
2. Correct reported problem

Customers warranty continues to be valid on repaired or replaced product from original warranty date.

Restrictions

This warranty covers defects in manufacturing discovered while using the product as recommended by the manufacturer. The warranty does not apply to a) equipments, materials, or supplies not manufactured by Sunforce Products. b) Product that has been modified or altered other than by Sunforce Products or without prior Sunforce Products approval. c) Has been exposed to winds exceeding 157mph d) Windstorms, lightning and Hail damage e) Repairs performed by other than authorized Sunforce Products support staff. f) All acts of God; misuse, negligence or accidents. g) Tower foundation and wire h) has not been installed, operated, repaired or maintained in accordance with the instructions supplied by manufacturer. Any service identified in the above list or product is found not to have any defect in manufacturers' workmanship or materials the customer will be responsible for the costs of all repairs and expenses incurred by Sunforce Products.

Disclaimer

EXCEPT FOR THE EXPRESSED WARRANTY SET FORTH ABOVE, THE MANUFACTURER DISCLAIMS ALL OTHER EXPRESSED AND IMPLIED WARRANTIES, INCLUDING THE IMPLIED WARRANTIES OR FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY AND NON-INFRINGEMENT. NO OTHER WARRANTY, EXPRESSED OR IMPLIED, WHETHER OR NOT SIMILAR IN NATURE TO ANY OTHER WARRANTY PROVIDED HEREIN, SHALL EXIST WITH RESPECT TO THE PRODUCT SOLD UNDER THE PROVISIONS OF THESE TERMS AND CONDITIONS. THE MANUFACTURER EXPRESSLY DISCLAIMS ALL LIABILITY FOR BODILY INJURIES OR DEATH THAT MAY OCCUR, DIRECTLY OR INDIRECTLY, BY USE OF THE PRODUCT BY ANY PERSON. ALL OTHER WARRANTIES ARE EXPRESSLY WAIVED BY THE CUSTOMER.

Warranty Claims & Return Policies

To be eligible for service under this warranty, customer must either contact manufacturer either through written request or by telephone to submit a service request for the wind turbine covered by this warranty within specified period (5 years from original date of purchase) and request a return authorization (RA) number, This RA # must be issued before any product can be returned.

All notifications must include the following information:

a) Description of alleged defect
b) How the wind turbine was being used
c) Serial #
d) The original purchase date
e) Name, phone #, address of party requesting warranty

Within 2 to 3 business days Sunforce Products will provide the customer with an RA# and will direct customer to location where the product is to be returned. Once an RA has been issued the customer has 30 days to return

the product. Failure to deliver the product within the 30 days results in the RA as no longer being valid and a new RA must be issued. Manufacturer is under no obligation to accept any product that is returned to them without a proper RA #.

Limitation of Liability

UNDER NO CIRCUMSTANCES WILL THE MANUFACTURER OR ITS AFFILIATES OR SUPPLIERS BE LIABLE OR RESPONSIBLE FOR ANY LOSS OF USE, INTERRUPTION OF BUSINESS, LOST PROFITS, LOST DATA, OR INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND REGARDLESS OF THE FORM OF ACTION, WHETHER IN CONTRACT, TORT (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE, RESULTING FROM THE DEFECT, REPAIR, REPLACEMENT, SHIPMENT OR OTHERWISE, EVEN IF THE MANUFACTURER

OR ITS AFFILIATE OR SUPPLIER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. (Note: some states and provinces do not allow the exclusion or limitation of incidental or consequential damages, so these limitations may not apply to you.) Neither the manufacturer nor its affiliates or suppliers will be held liable or responsible for any damage or loss to any items or products connected to, powered by or otherwise attached to the hardware. The total cumulative liability to Customer, from all causes of action and all theories of liability, will be limited to and will not exceed the purchase price of the Product paid by Customer. This warranty gives the Customer specific legal rights and the Customer may also have other legal rights that vary from state to state or province to province.

MPPT Marine Charge Controller

User's Manual

Congratulations on your Sunforce Products purchase. This product is designed to the highest technical specifications and standards. It will supply years of maintenance free use. Please read these instructions thoroughly prior to installation, then store in a safe place for future reference. If at any time you are unclear about this product, or require further assistance please do not hesitate to contact our trained professionals operating the customer support line 1-888-478-6435 or email to info@sunforceproducts.com

Introduction:

Your Maximum Power Point Tracking (MPPT) charge controller enables the 600 watt marine turbine to achieve its highest possible performance by periodically tracking the Maximum Power Point of the turbine's output. The MPPT can be used with battery systems of either 12v or 24v DC. This user guide will demonstrate the basic operation and troubleshooting of your MPPT charge controller.

Features:

- Maximum Power Point Tracking technology.
- 12 / 24 Volt automatic detection system.
- Temperature-Compensated, Three-Stage Charge Regulation.
- Fully Waterproofed design
- Inline Fuse (40Amp)
- Manual/Automatic braking system

Power Output: 450 Watt @ 12V (Max 450W) / 500 Watt @ 24V (Max 600W)
Charge Voltage: 12V / 24V (auto detect)
Input Voltage: 5~75 Volts AC
Efficiency: >97-99%
Battery Type: 12V/24Volt

Wiring:
Caution: for safety reasons before any wiring, please ensure that the manual brake is set to the "ON" position.

The three output wires from wind turbine carry 3 phase AC current. These three wires need to be connected to the corresponding 3 wire configuration coming from the MPPT charger. Wires require clean water resistant connections.

The secondary wire coming from the MPPT charger has two purposes.

1. Connection to either a 12 Volt or 24 Volt battery system

2. Connection directly to a 12/24 Volt load

- Red, Positive (+)
- Black, Negative (-)

The included Amp meter can be wired in at this point, between MPPT and battery bank.

The load connection wire is fused (40A). Should you not be utilizing this option, simply disconnect the fuse to block any risk of current transfer

Reading your LED's

- Power on (Green). Illuminates when the turbine, MPPT, battery is connected.
- Charging/Discharging (Green). Illuminates when turbine begins charging cycle. Under 12Volts the LED will 'blink'. When Turbine is in brake mode or during prolonged periods of turbine inactivity the LED may blink to show a small Discharge from the battery.
- Protection (Red). Illuminates when either the brake is manually activated, or internal safety mechanism is activated. Under manual braking the LED may blink.

Notification:

1. Multiple function MPPT chargers will charge a battery and may also be connected to a DC to AC power inverter or a DC load. The current output passed by the terminal will also be managed by the MPPT.
2. Loose connections can cause a large voltage drop to occur which may result in damage to the wires and insulation. Always adhere to correct polarity. Double check before you activate your system. Damage caused by reverse polarity is not covered under the warranty. When connecting the positive (+) terminal to the 12 volt power source's positive (+) terminal, a spark may occur. This is a normal occurrence. Because of the possibility of this sparking, it is critical that both the turbine and the 12 / 24 volt battery be placed well away from any possible source of inflammable fumes and/or gases.
3. The charger is equipped with an auto brake function. However it is strongly suggested that the user turn on the manual brake in extreme weather conditions.
4. Check the battery health periodically. If the voltage of the battery is lower than 10Volt the charger will not work and the turbine will automatically lock.

Important Safety Measures

- For the most effective use, place the MPPT Controller on a flat surface.
- Refrain from moving the MPPT whilst in 'Charging" state.
- All wire connections should be secure and sealed watertight.

Multi –Stage Battery Charging:
The MPPT charge controller is a sophisticated multi-stage battery charger that uses several regulation stages to allow fast recharging of the battery system while ensuring a long battery life. This process can be used with both sealed and non-sealed batteries. The MPPT will automatically set the charging regulation voltage set points (absorb & float) for the selected nominal battery voltage.

Troubleshooting Guide

MPPT does not turn on (Green LED)
1. Check battery connection and polarity.
Reverse polarity or improper connection will cause power-up issues.
2. Is the battery voltage greater than 10.5v?
A battery voltage less than 10.5v will not power up the MPPT.

MPPT not producing expected power

1. Are wind conditions optimal?

The primary consideration in a wind generator is the average wind speed at the installation site. Wind turbines in locations with constantly high wind speeds bring best return on investment.

2. Are the batteries charged? Is the MPPT in the absorbing or float stage?

If so, the MPPT will produce enough power to regulate the voltage at the absorption or float set point voltage, therefore, requiring less power in these modes.

3. Are you using the correct wire gauge?

Please consult the wire chart in your 600 Watt Marine Turbine owner's manual.

Warranty:
This product is covered under a five year limited warranty. Sunforce Products Inc. Warrants to the original purchaser that this product is free from defects in materials and workmanship for the period of five years from date of purchase. To obtain warranty service please contact Sunforce Products for further instructions, at 1 888 478-6435 or email info@sunforceproducts.com please note that proof of purchase including date, and expiration of compmaint is required for warranty service.

For more information or technical support

1-888-478-6435

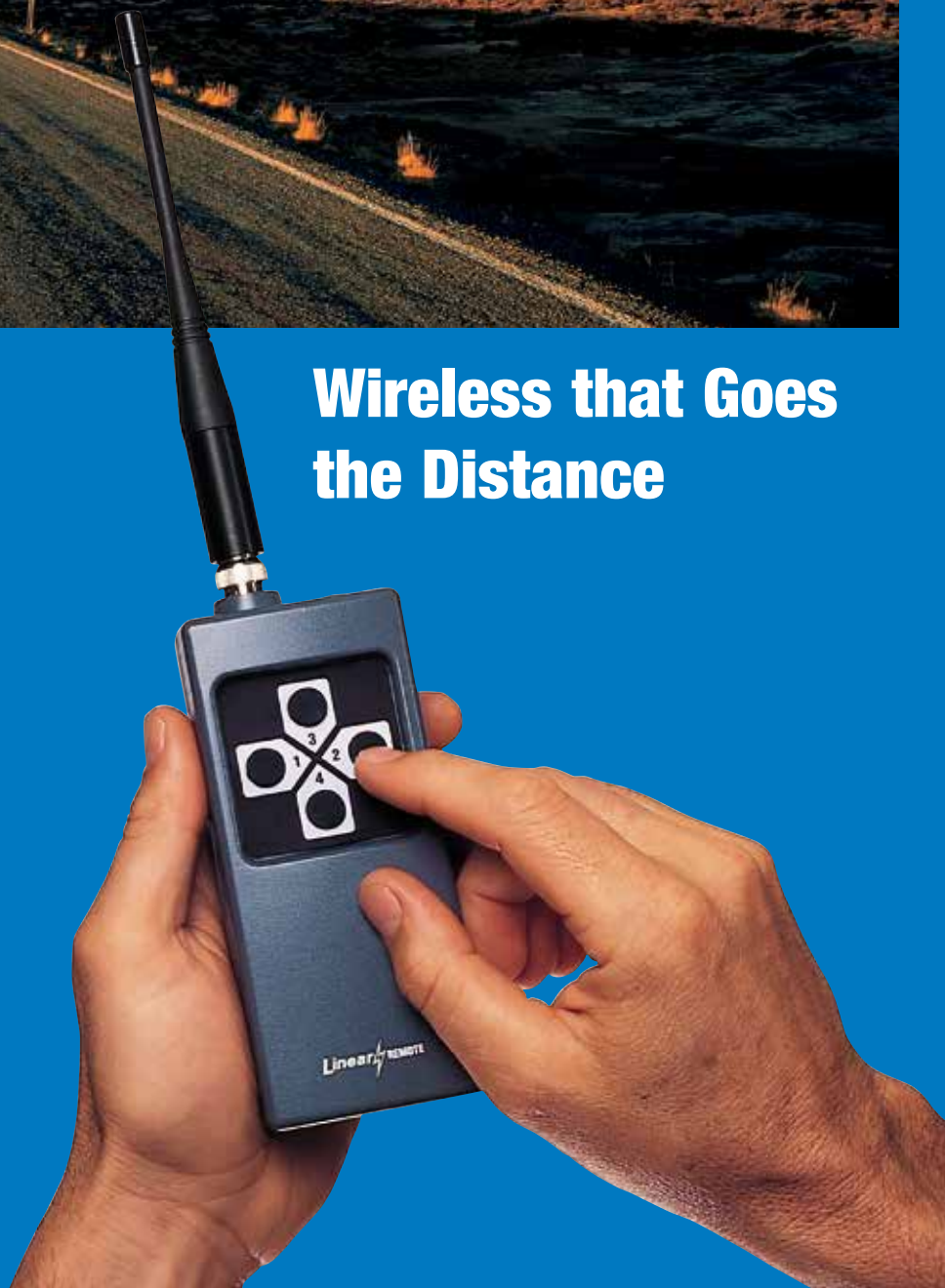
www.sunforceproducts.com

info@sunforceproducts.com

MMPPTE011711

Xtended Range from Linear

Wireless that Goes the Distance



Linear®
Building On Innovation.

Handheld Transmitters

Linear's Xtended Range wireless receivers and transmitters are more than twice as powerful, 6 times more sensitive, and 3 times more immune to interference than the next best mid-range wireless equipment.

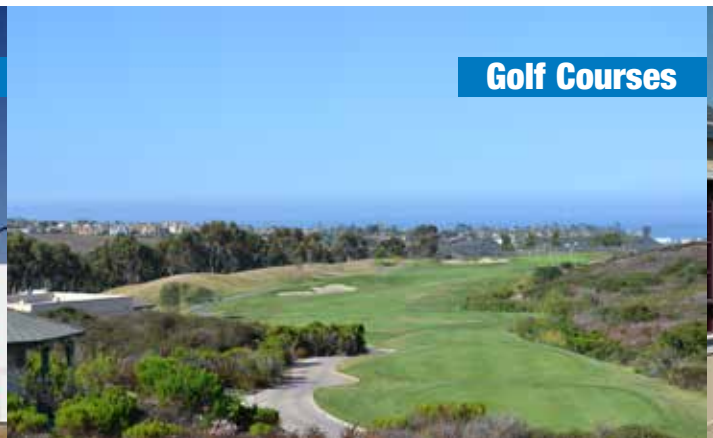
Handheld Transmitter Specifications

Frequency: 27.255 MHz ± .0025% (center frequency)
Bandwidth: 6 KHz
RF modulation: FSK ± 2 KHz nominal
RF output impedance: 50 Ohm nominal
Data encoding format: EMR
Power output: 2 watts minimum
Input voltage range: battery operated
Input current: .5 Amp transmitting, less than 1 µA standby
Reverse battery protection: yes
Batteries: 2-9 Vdc batteries
Antenna: 8-inch antenna (supplied)
Loop response time: 500 ms
Transmit time: 1 second
Code transmissions: alarm and low battery
Measured range: approximately 2 miles
Programming inputs:
- **System code select:** two, eight-position DIP switches (16 bits, 65,536 codes)
- **Rx channel select:** two DIP switch positions
- **Bank select:** two DIP switch positions

Buttons: tactile type
Button debounce time: buttons must remain stable for 150 ms for a transmission to begin
Indicators: one red LED lights when transmitter is pressed and flashes when power supply voltage falls below specified voltage
Temperature range: -20° to +60°C (-4° to +140°F)
Housing: grey, weather-resistant, high impact plastic
Connectors:
- **RF:** BNC

Size: 2.5 x 4.75 x 1.25 in (64 x 121 x 32 mm)
Weight: 1 lb (0.454 kg)
Regulatory: FCC Part 95, no license required

USES:



Stationary Transmitters

XT-1
1 Channel
Transmitter

XT-4
4 Channel
Transmitter

Stationary Transmitter Specifications

Frequency: 27.255 MHz ± .0025% (center frequency)
Bandwidth: 6 KHz
RF modulation: FSK ± 2 KHz nominal
RF output impedance: 50 Ohm nominal
Data encoding format: EMR
Power output: 10 watts minimum
Time out: built into the code format
Input voltage range: 11 to 15 Vdc (13.5 Vdc nominal)
Input current: 2 Amps maximum transmitting; 15 µA typical standby
Input current protection: fused with reverse polarity protection
Loop response time: 500 ms
Transmit time: 1 second
Code transmissions: alarm, restore, status, and low battery
Status report time frame: 70 minutes
Programming inputs:
- **System code select:** two, eight-position DIP switches (16 bits, 65,536 codes)
- **Rx channel select** (XT-1 only): two DIP switch positions
- **Bank select:** two DIP switch positions
- **Status select:** single DIP switch, ON-enabled, OFF-disabled
- **Auto-restore select:** single DIP switch, ON-enabled, OFF-disabled
- **N/O, N/C select:**
  XT-1: two-position jumper to select input type
  XT-4: four-position DIP switch to select input type

Test button: internal; transmitter sends a status signal when test button is pressed (if pressed and held, transmitter times out after 30 ±3 seconds
Indicators: one red LED lights when transmitter is pressed and flashes when power supply voltage falls below specified voltage; LED located underneath rear cover
Temperature range: -4° to +140°F (-20° to +60°C)
Housing: black, weather-resistant, anodized aluminum enclosure with removable end caps to provide wiring and programming access; end caps secured with screws
Connectors:
- **RF:** SO-239
- **External input:**
  XT-1: two-position screw terminals (input and ground)
  XT-4: eight-position screw terminals (input and ground per channel)
- **Power supply input:** two-position screw terminals (power and ground)

Size: 4.25 x 6.25 x 2.5 in (108 x 159 x 64 mm)
Weight: 1.0 lbs (0.454 kg)
Regulatory: FCC Part 95, no license required
Note: Requires ANT-2 antenna kit for proper operation

Stationary Receivers

Frequency: 27.255 MHz
± .0025% (center frequency)
RF modulation: FSK ± 2 KHz (nominal)
RF input impedance: 50 Ohm nominal
Receiver type: superheterodyne
Data input: alarm, restore, status, and low battery
Data decoding format: EMR
Common outputs
- **Status exception:** one open collector output per receiver, 20 Vdc @ 50 mA maximum
- **Status exception time frame:** 4 hours
- **Low battery:** one open collector output per receiver, 20 Vdc @ 50 mA max
- **Signal strength test point:** buffered signal strength output (0 to 5 V)

Common connectors
- **RF:** SO-239
- **Status and low battery:** XR-1 and XR-4, two-position screw terminals (status and low battery); XR-16, three-position screw terminals (status, low battery, and ground)
- **Power supply input:** two-position screw terminals (power and ground)

Sensitivity: -115 dBm (or better)
Selectivity: 8 KHz
Number of codes: 65,536
Code setting method: two, eight-position DIP switch programming
Image rejection: 50 dB minimum
Adjacent channel rejection: greater than 50 dB ± 9 KHz from Fc
Input voltage range: 11 to 15 Vdc (13.5 Vdc nominal)
Input current: reference specific receiver(s)
Input current protection: reverse polarity protection
Temperature range: -20° to +60°C (-4° to +140° F)
Housing: black, weather-resistant, anodized aluminum enclosure with removable end caps to provide wiring and programming access, end caps secured with screws; window on XR-1 and XR-4
Test Jumpers:
- **Audio output:** test jumpers on the printed circuit board
- **Signal strength output:** test jumpers on the printed circuit board (0 to 5 V)

Regulatory: FCC Part 95, no license required
Note: Requires ANT-1A or ANT-2 antenna kit

XR-1
1 Channel Receiver

XR-4
4 Channel Receiver

Size: 4.25 x 6.25 x 2.5 in (108 x 159 x 64 mm)
Weight: 1 lb (0.454 kg)
Current drain:
XR-1: 25 mA, typical standby; 65 mA alarm @ 12 Vdc
XR-4: 25 mA, typical standby; 185 mA alarm @ 12 Vdc
Programming inputs:
- **System code select:** two, eight-position DIP switches (16 bits, 65,536 codes)
- **Status select:**
  XR-1: one DIP switch position, ON-enabled, OFF-disabled
  XR-4: four DIP switch positions (by channel), ON-enabled, OFF-disabled
- **Channel select**
  XR-1 only: two DIP switch positions, select channel 1, 2, 3, or 4

Additional outputs:
- **Alarm:** Form "C" relay per channel, 1 A @ 32 Vdc (N/O, N/C, and common)

Additional connectors:
- **Alarm output:**
  XR-1: three-position screw terminals (N/O, N/C, and COM)
  XR-4: four sets of three-position screw terminals (N/O, N/C, and common)

Indicators: one red LED lights when there is RF activity and one green Power On LED; LEDs visible when rear cover is on the unit

XR-16
16 Channel Receiver

Size: 6.5 x 7.9 x 1.25 in (165 x 201 x 32 mm)
Weight: 1.5 lbs (0.680 kg)
Current drain: 300 mA maximum @ 12 Vdc
Programming inputs:
- **System code select:** two, eight-position DIP switches (16 bits, 65,536 codes)
- **Status select:** two, eight-position DIP switches, one position per channel, ON-enabled, OFF-disabled
- **Trouble disable:** jumper—remove to disable, trouble output on channel and trouble output relay

Additional outputs:
- **16 open collector:** (20 Vdc @ 50 mA, maximum), field programmable for either N/O or N/C operation
- **Channel and trouble output:** form "C" relay, 1 A @ 32 Vdc (N/O, N/C, and common); this output is activated when any output is activated (channel, status, or low battery)

Additional connectors:
- **Channel and trouble output:** three-position screw terminals (N/O, N/C, and common)
- **Channel outputs:** twenty-position screw terminals, 16 channel outputs, and four grounds

Indicators: three, seven-segment displays; provides alarm, status, and low battery indication by channel; RF activity displayed by the decimal point

When there's nothing but 10 miles of bad road (or no road) between you and a remote site, Xtended Range gets you there.

With the new Xtended Range family of products, we now offer one of the industry's longest range wireless transmitter-receiver activation systems, giving you up to 10 miles line-of-sight. In the right terrain and system conditions you may even be able to transmit 15 miles or more*. Linear's Xtended Range is the long-distance leader, beating nearly every comparable wireless transmission device on the market.

Linear Means Power: Increased output capability from 4 watts to 10 watts minimum per channel, enabling more than double the operating range than the competition.

Super Sensitivity: Crystal controlled, FM-based receivers operate in the CB band of frequencies at 27.255 MHz and offer sensitivity of -115 dBm or better.

Interference Immunity: Highly selective Xtended Range uses FSK rather than AM modulation, so it won't pick up stray signals. The absence of typical FM interference makes it a super-reliable long-distance link.

Compact & Reliable: Advanced circuit technology packs maximum capability into minimum space, significantly boosting reliability.

Fully Supervised: All Xtended Range products can perform automated checks to ensure that they are communicating properly – so you never have to worry about its status. The Xtended Range family offers hourly status reporting, low battery detection and reporting, and portal supervision for peace of mind. You also get field-selectable "Auto Restore" that triggers momentary receiver output when the transmitter input is activated.

Feature Rich: The Xtended Range product family offers Form C NO/NC relays on receivers, and the transmitters have internal RF test button and transmission indicator giving you visual verification of activity. Receivers have both power and RF activity indication and RF signal audio output, making the system easy to setup and configure.

Secure & Solid: Code clashes are unlikely as the Xtended Range has 64,000 available codes. Plus, receivers and transmitters are housed in time-tested weather-resistant cases with adjustable strain relief bushings to secure and shield wiring.

No FCC Licensing: Xtended Range receivers and transmitters do not require FCC licensing or registration, further easing customer installations.

Easy installation: Designed for quick setup and easy upgrades, DIP switches make system coding and mode changes fast, allowing for rapid addition or replacement of transmitters without having to visit the receiver and transmitter site.

*We field-tested the Xtended Range at distances of 20 miles, and the signal showed no sign of quitting.

Linear developed the Xtended Range suite of products with flexibility and variety in mind, so users can tailor long-distance links to their needs – remote monitoring, switching systems, networking, security, or remote control. Different models and channel combinations can be mixed and matched to accomplish your most sophisticated projects.

Accessories

ANT-1A 8-Inch Antenna
(for applications under one mile; for use with XR Receivers only)

ANT-2 3-Foot Whip Antenna
(for maximum range and difficult applications; required for XT-1, XT-4 Transmitters)

CON-90 Right Angle Antenna Connector for ANT-1A

T-1224DC Wall Mount Power Supply
(recommended for XT transmitters)

T-124.8DC Wall Mount Power Supply
(recommended for XR receivers)

Ordering Information

XT-1 Single-Channel Stationary Transmitter - Order number: SST00083

XT-4 Four-Channel Stationary Transmitter - Order number: SST00084

XT-1H Single-Channel Handheld Transmitter - Order number: SNT00395

XT-2H Two-Channel Handheld Transmitter - Order number: SNT00396

XT-4H Four-Channel Handheld Transmitter - Order number: SNT00397

XR-1 Single-Channel Stationary Receiver - Order number: SSR00068
(Form "C" alarm output)

XR-4 Four-Channel Stationary Receiver - Order number: SSR00069
(Form "C" alarm output per channel)

XR-16 16-Channel Stationary Receiver - Order number: SSR00066
(open collector alarm outputs)

WARNING: These products should not be used in life safety applications. FCC Rules allow unlicensed high-power transmissions at or near the operating frequency of these products, which may interfere with, or even disable, normal operation of the radios.

Specifications subject to change without notice.

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Building On Innovation.

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APX Enclosures, Inc.

Electrical Storms

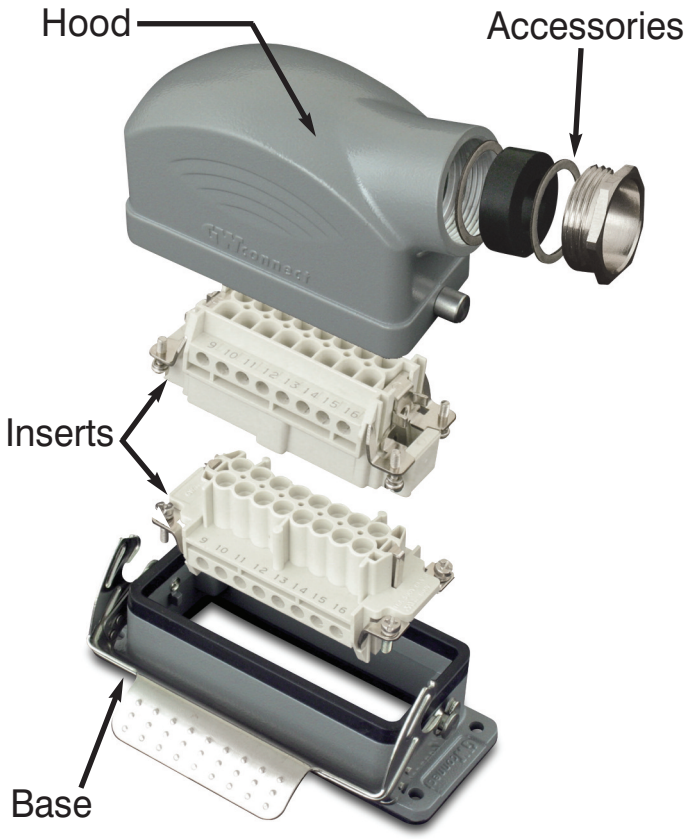
Hurricanes

Ice Storms

STD Series Multi-Wire Connectors

Features

- Available in 3A, 10A, 16A, 6B, 10B, 16B, 24B, and 32B sizes
- Heavy-duty metal housings in polyester powder coated die-cast aluminum alloy or self-extinguishing thermoplastic housing
- Single locking system (one lever locked on two pegs) or double locking system (two levers locked on four pegs)
- Mechanical duration of 500 cycles
- Operating temperatures from -40˚C to 125˚C (-40˚F to 257˚F)
- IP66 degree of protection with enclosure when coupled
- NEMA/UL Type 1, 4, 4X, 12 protection with enclosure when coupled.
- Conforms with EN61984, VDE 0110, VDE 0627, EN 175301-801, and UL 1977, UL50, UL50E standards
- UL and CE approvals



Housings

Hoods

- Available with top entry and side entry cable passages
- Standard and high-construction profiles
- Threaded cable passages with Pg threads (EN 60423) with optional Pg to NPT adapters
- Stainless steel or thermoplastic locking pegs
- Accessories include cable glands and Pg thread to NPT adapters

Bases, Couplers and Covers

- Surface and bulkhead mounted bases
- Two cable passages on surface mount bases
- Seal gaskets made of anti-aging, oil-resistant and fuel-resistant vinyl nitrile elastomer
- Locking levers made of galvanized steel or self-extinguishing glass-filled thermoplastic; guarantees perfect closing and sealing

Inserts

- Self-extinguishing thermoplastic reinforced with glass fibers
- Asymmetric guide rails prevent incorrect coupling
- Captive installation screws allow for easy and secure installation to bases and hoods
- Laser-printed or molded terminal/contact positions on both sides of insert
- Copper alloy contacts with hard silver or gold plating - available with stainless steel captive screw terminal or machined crimp contact
- Wide contact surface for ground terminals
- IP20 without enclosures
- Suitable for stranded and solid conductors

Accessories

- A wide range of accessories including:
  - Pg to NPT adapters
  - Plugs with gaskets
  - Cable glands (IP66 & IP68)
  - DIN rail mounting kits
  - Crimp tools
  - Replacement screws, code pins and gaskets
  - Insert plates (with cutouts, reducers, blank)
  - Coding pins

Agency Approvals

- UL Recognized File number E342543
- CE
- RoHS
- NEMA 250

ZIPport STD Series Multi-Wire Connectors

General Characteristics

Application Examples

- Electronic machinery
- Robots
- Control equipment
- Power connections
- Control and signal circuits
- Packaging machinery
- Theatrical applications
- Industrial equipment
- Electrical panels

Inserts

ZIPport multi-wire connectors require one male and one female insert. The inserts are available in multiple pole configurations from 3 poles plus ground up to 144 poles plus ground and with termination sizes ranging from 26 to 12 AWG, 10 to 80 Amps.

ZIPport inserts are made of UL 94 V-0 rated self-extinguishing thermoplastic resin rated at a maximum temperature of 125°C (257°F). The inserts are available in screw terminal and crimp style contact block connections. The contacts are copper alloy with a hard silver or gold plating. The plastic insulators are numbered on both sides by laser printing or molding in accordance with EN 60068-2-70.

- Suitable for use with alternating (AC) or direct current (DC)
- Leading protective ground
- Polarized for correct mating
- Interchangeable for male and female inserts in hoods and bases
- Captive screws
- Can be used with hoods and bases, or with rack and panel applications

Housings

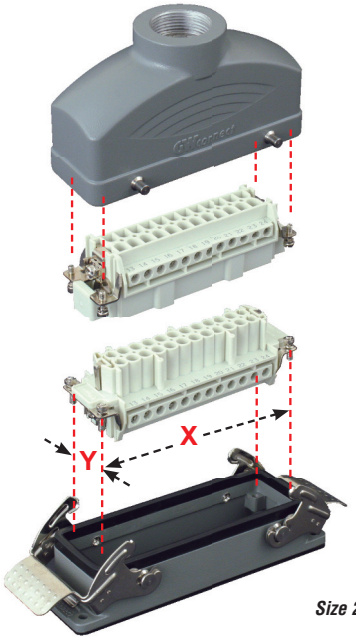
The housings for the ZIPport multi-wire connectors consist of a hood that mates with a base or a coupler.

They are made of die-cast aluminum with a polyester powder finish or from self-extinguishing thermoplastic and are suitable for use in industrial applications.

All housings are available in a standard profile. Several are offered with a high construction (HC) profile that allows more room for wiring the higher density inserts.

A single or double lever locking system assures coupling stability and protection against accidental opening. The locking system is comprised of stainless steel or glass filled thermoplastic levers, with compatible interlocking pegs.

Size and Identification



Size 24B shown

The size of each type of connector is determined by the distance between the center points of the four installation screws. These four points are common to both the insert and the housing. This is indicated by "X"-"Y" in the illustration above.

The table below lists the size identification and the actual X-Y distance for each type of connector offered.

Size	Distance X-Y
3A	21 x 21 mm* [0.83 x 0.83 in]
10A	49.5 x 16 mm [1.95 x 0.63 in]
16A	66 x 16 mm [2.60 x 0.63 in]
6B	44 x 27 mm [1.73 x 1.06 in]
10B	57 x 27 mm [2.24 x 1.06 in]
16B	77.5 x 27 mm [3.05 x 1.06 in]
24B	104 x 27 mm [4.09 x 1.06 in]
32B	77.5 x 62 mm [3.05 x 2.44 in]

** The center distance cannot be given because the 3A inserts have only one screw: 21 x 21 indicates the size of the sectioned insert.*

STD Series Multi-Wire Connectors Specifications

Technical Characteristics											
Connector Size			**3A**					**10A**		**16A**	
Inserts	Number of Poles		3+PE	4+PE	5+PE	7+PE	12+PE	10+PE	15+PE	16+PE	25+PE
	UL/CSA Rated Voltage*		600V								
	Maximum Rated Current		10A		16A	10A		16A	10A	16A	10A
	EN 61984 (2001-11) Pollution Degree 3	Rated Voltage AC/DC	230/400V			250V	400V	250V			
		Impulse Withstand Voltage	4kV				6kV	4kV			
	EN 61984 (2001-11) Pollution Degree 2	Rated Voltage	230/400V		320/500V	230/400V	400/690V	230/400V			
		Impulse Withstand Voltage	4kV				6kV	4kV			
	Continuous Current Carrying Capacity		Refer to Electrical Engineering section charts								
	Insulation Resistance		$10^{10}\,\Omega$								
	Material		Polycarbonate								
	Temperature Range		-40°C to 125°C (-40°F to 257°F)								
	Flammability		UL 94 V-0 GWT 960°								
	Degree Protection	With Housing	IP66, NEMA/UL (Type 1, 4, 4x, 12)								
		Without Housing	IP20								
	Mechanical Working Life		500 Cycles								
	Conductor Termination	Screw Terminals	✔	✔	N/A	N/A	N/A	✔	N/A	✔	N/A
		Crimp Contacts	N/A	N/A	✔	✔	✔	✔	✔	✔	✔
Contacts	Material		Hard-silver plated (2µm Au) or gold plated copper alloy								
	Min. Recommended Load (voltage & current)		5V/5mA AC/DC (silver plated)								
	Contact Resistance		≤1 mΩ			≤3 mΩ		≤1 mΩ	≤3 mΩ	≤1 mΩ	≤3 mΩ
	Screw Terminal Wire Size	mm ²	0.5-2.5 mm²		N/A			0.5-2.5 mm²	N/A	0.5-2.5 mm²	N/A
		AWG	20-14 AWG		N/A			20-14 AWG	N/A	20-14 AWG	N/A
	Screw Terminal Tightening Test Torque		0.5 Nm		N/A			0.5 Nm	N/A	0.5 Nm	N/A
	Screw Terminal Stripping Length		7.0 mm		N/A			7.0 mm	N/A	7.0 mm	N/A
	Crimp Terminal Wire Size	mm ²	N/A		0.5-2.5 mm²		0.14-2.5 mm²	0.14-4.0 mm²	0.14-2.5 mm²	0.14-4.0 mm²	0.14-2.5 mm²
		AWG	N/A		26-14 AWG			26-12 AWG	26-14 AWG	26-12 AWG	26-14 AWG
	Crimp Terminal Stripping Length		N/A		7.5 mm		N/A	7.5 mm	N/A	7.5 mm	N/A
Thermoplastic Hoods/ Bases/ Couplers/ Covers	Material		Glass filled polyamide					N/A			
	Locking Element		Glass filled polyamide lever and peg								
	Flammabilty		UL 94 V-0 GWT 960°								
	Housings Seal		NBR (Nitrile rubber)								
	Degree of Protection Acc. to EN 60529 (coupled)		IP66								
	Temperature Range		-40°C to 125°C (-40°F to 257°F)								
	Thread		Metric EN 50262 Pg DIN 40430								
Aluminum Hoods/Bases/ Couplers/ Covers	Material		Die cast aluminum alloy, Polyester powder coated								
	Locking Element		Stainless steel lever and peg								
	Housings Seal		NBR (Nitrile) or FPM (Viton)								
	Degree of Protection Acc. to EN 60529 (coupled) NEMA 250, UL50, 50E		IP66, NEMA/UL (Type 1, 4, 4x, 12)								
	Temperature Range		-40°C to 125°C (-40°F to 257°F)								
	Thread		Metric EN50262 Pg DIN 40430								

**** Connectors should not be coupled and decoupled under electrical load.***

STD Series Multi-Wire Connectors Specifications

Technical Characteristics										
Connector Size			**6B**		**10B**		**16B**			
Inserts	Number of Poles		6+PE	24+PE	10+PE	42+PE	6+PE	16+PE	40+PE	72+PE
	UL/CSA Rated Voltage*		600V							
	Maximum Rated Current		16A	10A	16A	10A	35A	16A	10A	
	EN 61984 (2001-11) Pollution Degree 3	Rated Voltage AC/DC	500V	250V	500V	250V	830V	500V	250V	
		Impulse Withstand Voltage	6kV	4kV	6kV	4kV	6kV		4kV	
	EN 61984 (2001-11) Pollution Degree 2	Rated Voltage	400/690V	230/400V	400/690V	230/400V	1000V	400/690V	230/400V	
		Impulse Withstand Voltage	6kV	4kV	6kV	4kV	8kV	6kV	4kV	
	Continuous Current Carrying Capacity		Refer to Electrical Engineering section charts							
	Insulation Resistance		$10^{10}\,\Omega$							
	Material		Polycarbonate							
	Temperature Range		-40°C to 125°C (-40°F to 257°F)							
	Flammability		UL 94 V-0 GWT 960°							
	Degree Protection	With Housing	IP66, NEMA/UL (Type 1, 4, 4x, 12)							
		Without Housing	IP20							
	Mechanical Working Life		500 Cycles							
	Conductor Termination	Screw Terminals	✔	N/A	✔	N/A	✔	✔	N/A	N/A
		Crimp Contacts	✔	✔	✔	✔	N/A	✔	✔	✔
Contacts	Material		Hard-silver plated (2µm Au) or gold plated copper alloy							
	Minimum Recommended Load (voltage & current)		5V/5mA AC/DC (silver plated)							
	Contact Resistance		≤ 1 mΩ	≤ 3 mΩ	≤ 1 mΩ	≤ 3 mΩ	≤ 0.5 mΩ	≤ 1 mΩ	≤ 3 mΩ	
	Screw Terminal Wire Size	mm ²	0.5-2.5mm²	N/A	0.5-2.5mm²	N/A	1.5-6 mm²	0.5-2.5 mm²	N/A	
		AWG	20-14 AWG	N/A	20-14 AWG	N/A	16-10 AWG	20-14 AWG	N/A	
	Screw Terminal Tightening Test Torque		0.5 Nm	N/A	0.5 Nm	N/A	1.2 Nm	0.5 Nm	N/A	
	Screw Terminal Stripping Length		7.0 mm	N/A	7.0 mm	N/A	10.5 mm	7.0 mm	N/A	
	Crimp Terminal Wire Size	mm ²	0.14-4 mm²	0.14-2.5 mm²	0.14-4 mm²	0.14-2.5 mm²	N/A	0.14-4 mm²	0.14-2.5 mm²	
		AWG	26-12 AWG	26-14 AWG	26-12 AWG	26-14 AWG	N/A	26-12 AWG	26-14 AWG	
	Crimp Terminal Stripping Length		7.5 mm	8 mm	7.5 mm	8 mm	N/A	7.5 mm	8 mm	
Aluminum Hoods/Bases/ Couplers/ Covers	Material		Die cast aluminum alloy, Polyester powder coated							
	Locking Element		Stainless steel lever and peg							
	Housings Seal		NBR (Nitrile) or FPM (Viton)							
	Degree of Protection Acc. to EN 60529 (coupled) NEMA 250, UL50, 50E		IP66, NEMA/UL (Type 1, 4, 4X, 12)							
	Temperature Range		-40°C to 125°C (-40°F to 257°F)							
	Thread		Metric EN50262 Pg DIN 40430							

**** Connectors should not be coupled and decoupled under electrical load.***

STD Series Multi-Wire Connectors Specifications

Technical Characteristics								
Connector Size			**24B**				**32B**	
Inserts	Number of Poles		4+8+PE	24+PE	64+PE	108+PE	32+PE	144+PE
	UL/CSA Rated Voltage*		600V					
	Maximum Rated Current		Power: 80A / Signal: 16A	16A	10A		16A	10A
	EN 61984 (2001-11) Pollution Degree 3	Rated Voltage AC/DC	830V / 400V	500V	250V		500V	250V
		Impulse Withstand Voltage	8kV / 6kV	6kV	4kV		6kV	4kV
	EN 61984 (2001-11) Pollution Degree 2	Rated Voltage	1000V/400/690V	400/690V	230/400V		400/690V	230/400V
		Impulse Withstand Voltage	8kV	6kV	4kV		6kV	4kV
	Continuous Current Carrying Capacity		Refer to Electrical Engineering section charts					
	Insulation Resistance		$10^{10}\,\Omega$					
	Material		Polycarbonate					
	Temperature Range		-40°C to 125°C (-40°F to 257°F)					
	Flammability		UL 94 V-0 GWT 960°					
	Degree Protection	With Housing	IP66, NEMA/UL (Type 1, 4, 4X, 12)					
		Without Housing	IP20					
	Mechanical Working Life		500 Cycles					
	Conductor Termination	Screw Terminals	✔	✔	N/A	N/A	✔	N/A
		Crimp Contacts	N/A	✔	✔	✔	✔	✔
Contacts	Material		Hard-silver plated (2µm Au) or gold plated copper alloy					
	Minimum Recommended Load (voltage & current)		5V/5mA AC/DC (silver plated)					
	Contact Resistance		$\leq 0.3\,m\Omega$ / $1m\Omega$	$\leq 1\,m\Omega$	$\leq 3\,m\Omega$		$\leq 1\,m\Omega$	$\leq 3\,m\Omega$
	Screw Terminal Wire Size	mm^2	1.5-16 mm^2 / 0.5-2.5 mm^2	0.5-2.5 mm^2	N/A		0.5-4.0 mm^2	N/A
		AWG	16-6 AWG / 20-14 AWG	20-14 AWG	N/A		20-12 AWG	N/A
	Screw Terminal Tightening Test Torque		1.2 Nm / 0.5 Nm	0.5 Nm	N/A		0.5 Nm	N/A
	Screw Terminal Stripping Length		14 mm / 7.0 mm	7.0 mm	N/A		7.0 mm	N/A
	Crimp Terminal Wire Size	mm^2	N/A	0.14-4 mm^2	0.14-2.5 mm^2		0.14-4 mm^2	0.14-2.5 mm^2
		AWG	N/A	26-12 AWG	26-14 AWG		26-12 AWG	26-14 AWG
	Crimp Terminal Stripping Length		N/A	7.5 mm	8 mm		7.5 mm	N/A
Aluminum Hoods/Bases/ Couplers/ Covers	Material		Die cast aluminum alloy, Polyester powder coated					
	Locking Element		Stainless steel lever and peg					
	Housings Seal		NBR (Nitrile) or FPM (Viton)					
	Degree of Protection Acc. to EN 60529 (coupled) NEMA 250, UL50, 50E		IP66, NEMA/UL (Type 1, 4, 4X, 12)					
	Temperature Range		-40°C to 125°C (-40°F to 257°F)					
	Thread		Metric EN50262 Pg DIN 40430					

**** Connectors should not be coupled and decoupled under electrical load.***

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Electrical Storms

Hurricanes

Ice Storms